SOIL SURVEY

St. Charles County Missouri

Series 1939, No. 28

Issued January 1956

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with the
MISSOURI AGRICULTURAL EXPERIMENT STATION

How to Use THE SOIL SURVEY REPORT

FARMERS WHO have worked with their soils a long time know how their soils differ from those on farms of their near neighbors. What they do not know, unless soil surveys have been made, is how nearly their soils are like those on experiment stations or other farms, in their State or other States, where new or different practices have been tried successfully. Farmers of St. Charles County can avoid some of the risk and uncertainty involved in trying new crops and soil management practices by using this report, for it maps and describes the soils in their county and allows them to compare soils on their farms with soils on which new developments have proved successful.

SOILS OF A PARTICULAR FARM

All the soils in St. Charles County are shown on the colored soil map that accompanies this report. First find the boundaries of your farm by using section lines and such landmarks as roads, streams, villages, and dwellings. Remember that an inch on the map equals about three-fourths of a mile on the ground.

The next step is to identify the soils on the farm. Suppose, for example, you find an area marked with the letter symbol Ba. Look among the colored rectangles in the margin of the map and find the one with Ba printed on it. Just above this rectangle is the name of the soil—Beaucoup clay. All areas of this soil, wherever they appear on the map, are identified by the same color and symbol.

What is Beaucoup clay like? How is it used? To what uses it is suited? For this information first turn to the section, Soil Types and Phases, and then to the section, Use, Management, and Productivity of the Soils. What does the soil yield? The answer will be found in table 3, where all the soils of the county are listed and estimated yields of principal crops are given for each. Compare the yields given for Beaucoup clay with those for other soils.

What kind of management does Beaucoup clay need? For this information read in the section, Soil Types and Phases. Refer also to the section, Use, Management, and Productivity of the Soils.

SOILS OF THE COUNTY AS A WHOLE

A general idea of the soils of the county is given in the sections on soil associations, which tell about the principal kinds of soils, where they are found, and how they are related to one another.

A newcomer to the county, especially if he considers purchasing a farm, will want to know about the climate; the types and sizes of farms; the principal farm products and how they are marketed; the industries of the county; and cities, villages, and population characteristics. Information about all these will be found in the section, General Nature of the County, and the section, Agriculture.

Those interested in how the soils of the county were formed and how they are related to the great soil groups of the world should read the section, Morphology, Genesis, and Classification of Soils.

This publication on the soil survey of St. Charles County, Mo., is a cooperative contribution from the—

SOIL CONSERVATION SERVICE

and the

MISSOURI AGRICULTURAL EXPERIMENT STATION

Series 1939, No. 28 Issued January 1956

SOIL SURVEY OF ST. CHARLES COUNTY, MISSOURI

Report by W. D. SHRADER [1] and H. H. KRUSEKOPF [2]

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United States Department of Agriculture in cooperation with the Missouri Agricultural Experiment Station

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ST. CHARLES COUNTY is a roughly triangular area stretching westward about 55 miles from the place where the Missouri River joins the Mississippi. About half the county is bottom land along these two rivers; the rest is mostly gently rolling upland. On the upland, where dairying tends to be concentrated, the main crops are wheat, hay, and pasture. The bottom lands that are adequately drained and not frequently flooded are used almost entirely for tilled crops, principally corn and wheat.

The farmers practice a grain-and livestock type of agriculture well suited to the capabilities of the soils. They face the major problems of declining productivity and erosion on the uplands, and of soil drainage and flood damage on the bottom lands.

This report, made cooperatively by the United States Department of Agriculture and the Missouri Agricultural Experiment Station, is designed to aid farmers of St. Charles County in planning the best uses for their soils. It names and describes the soils of the county, shows their location on a large-scale map, and tells something about their use and management in 1939, the date when field work for this survey was completed. The survey will serve as a reliable source of information about soils for many years to come. It is not intended as a substitute for up-to-date, detailed information on management practices, crop varieties, and insect control that can be obtained from the county agricultural agent, local representatives of the Soil Conservation Service, the State experiment stations, and similar sources.

GENERAL NATURE OF THE COUNTY

Location and Extent

St. Charles County is located at the junction of the Mississippi and Missouri Rivers (fig. 1). Approximately 100 miles of the county boundary is formed by these two streams. The county has an area of approximately 535 square miles. About 250 square miles—almost half the county—is on the river bottoms.

Physiography and Relief

The county lies at the northeastern edge of the Ozark Plateaus province, but most of it is a part of the rolling plain in northeastern Missouri.

Most of the upland that drains directly into the Missouri River is deeply dissected, steep, and hilly. The entire drainage area of Femme Osage Creek is characterized by narrow ridges, steep rocky slopes, and narrow valleys. Perpendicular rock bluffs 75 to 150 feet high border the flood plain of the Missouri River.

The uplands in the northern and central parts of the county are gently rolling (fig. 2). No level areas occur, but the main divides between the larger streams are broad, rounded, and gently sloping. The slopes along the larger streams in this part of the county are frequently short, steep, and not suitable for cultivation. In general, most of the territory south and west of Wentzville and west of St. Charles is moderately hilly.

All of the upland that drains into the Mississippi River has lower relief than the upland that drains to the Missouri River. The Cuivre River and Dardenne and Perique Creeks all have broad flood plains and are bordered by low hills.

The highest elevation in the county, about 825 feet, is at the ridge on which New Melle is located. The lowest point, approximately 413 feet, is on the Mississippi River flood plain.

Geology

Most of the upland in this county has been covered by loess. During and following the glacial ages, vast quantities of this silty rock material were blown out of the flood plains bordering the rivers and spread over the surrounding hills and bluffs (fig. 3). The Menfro, Winfield, Weldon, Leslie, Bogota, Marion, and Mexico soils have developed from this material.

The deposit of loess is deepest on the bluffs bordering the flood plains, where it reaches a thickness of 50 feet or more and covers the slopes as well as the ridges. Farther back from the bluffs the loess becomes thinner and occurs only on the ridgetops. The ridge slopes have lost the thin deposit of loess through erosion; they are covered either by glacial till or by weathered limestone material. The kind of soil material on the slopes depends on the location. In the west-central part of the county there is the plastic, gritty clay till deposited by the Kansan glaciation many thousands of years ago. The Lindley soils have developed from this till. In the northwestern and south-

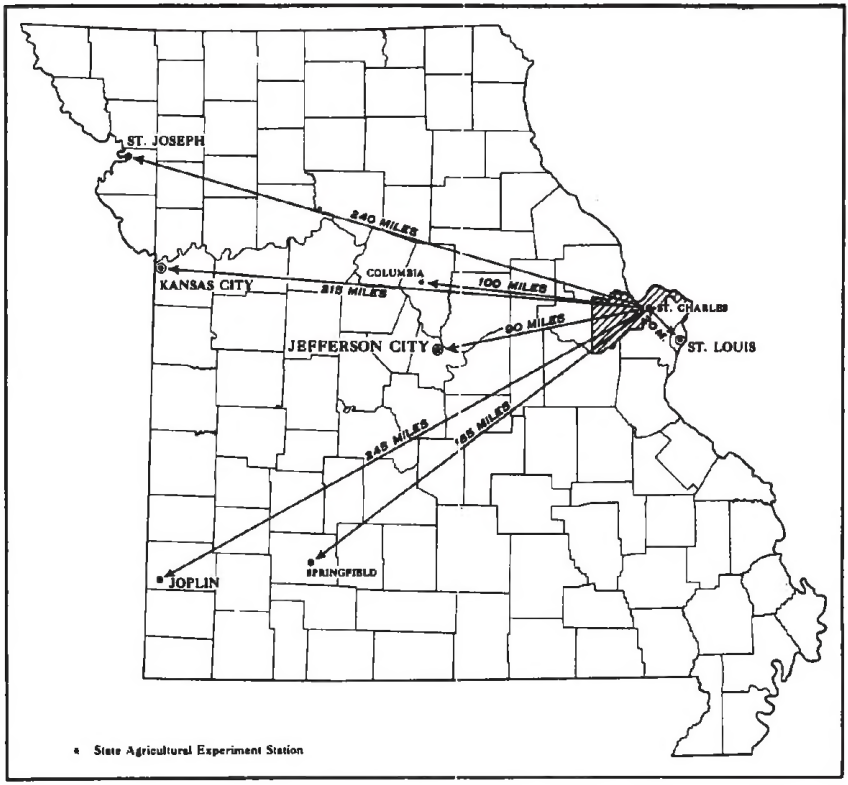

Figure 1.—**Location of St. Charles County in Missouri.**

western parts of the county the material weathered from limestone is exposed, and from it the Union soils and Steep stony land have developed.

The bottom land, which forms about half the county, consists of alluvial material deposited by the larger creeks and the Mississippi and Missouri Rivers (fig. 4). The alluvium along the Mississippi is dominantly clay, and that along the Missouri is mainly fine sandy loam. Nineteen of the twenty-five soil series classified in this county were derived from alluvial material.

Natural Vegetation

Most of the uplands in this county were forested when the first settlers arrived, but there were several grassland openings in the western part. These prairie areas—relatively broad gently sloping ridges now mapped as Mexico soil—had a mixed grassland cover in which big and little bluestems predominated. The area north of Josephville, occupied by the Leslie soil and known locally as the Dog Prairie, apparently had an original cover of mixed forest and prairie vegetation.

Figure 2.—**Rolling upland in St. Charles County, Mo.**

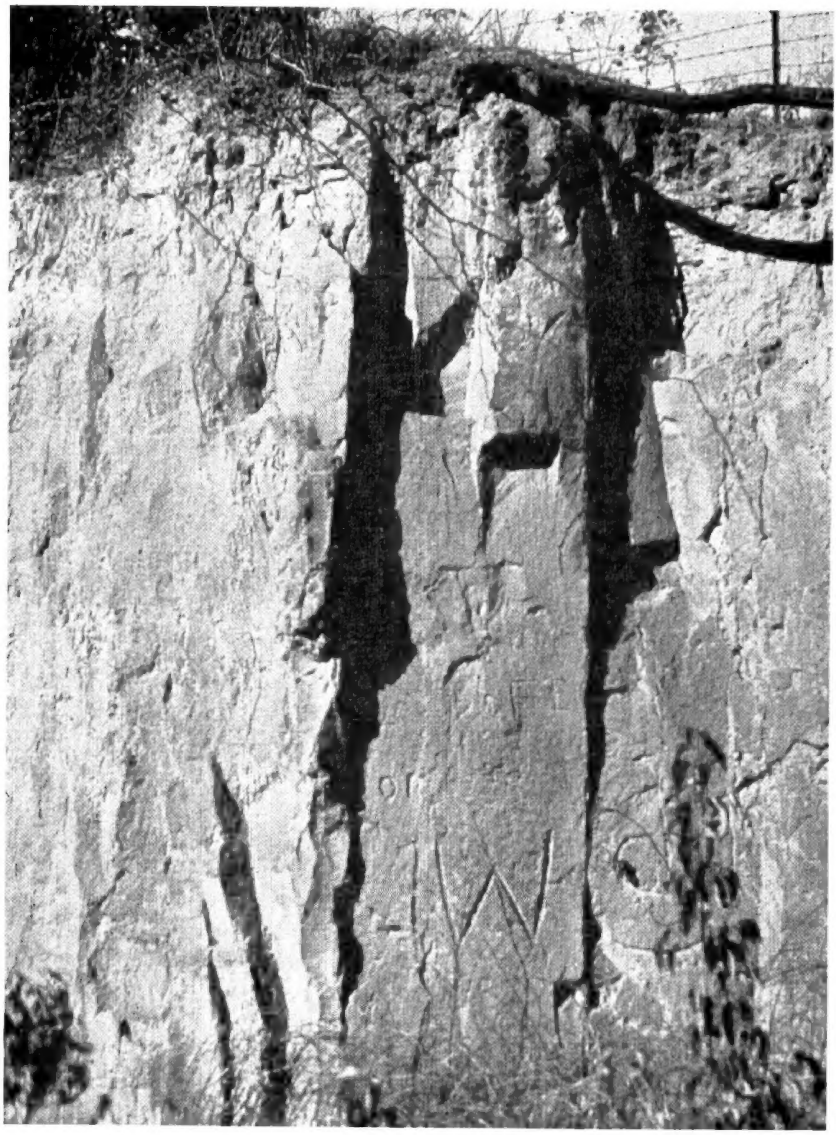

Figure 3.—**Roadside exposure of loess typical of those found in St. Charles County, Mo.**

Most of the bottom land along the Mississippi River was covered by coarse swampgrasses, but forest prevailed on the river banks and islands. Practically all of the bottom land along the Missouri River was heavily forested.

Climate

The climate of St. Charles County is continental and subject to wide variations in temperature and precipitation. Normal monthly, sea-

Figure 4.—**Bottom land along the Missouri River near St. Charles.**

sonal, and annual temperature and precipitation recorded at the Weather Bureau station at St. Charles, Mo., are considered representative for the county (table 1).

The average annual temperature is 55.3° F. The lowest recorded temperature is −24°, and the highest, 112°. The average annual precipitation is 37.49 inches, but the range is from 19.06 inches in the driest year reported to 57.15 inches in the wettest year.

The heaviest rainfall comes during spring and summer, and the lightest during winter. May and August have the most rainfall, and December and February the least. In spring, crops may be injured by excessive rain followed by dry weather. Crops on the bottom lands are sometimes injured or destroyed by spring floods. During July and August, periods of low rainfall sometimes cause low crop yields. These droughty periods do not show in the averages given in table 1.

The normal growing season of 193 days is ample for maturing all ordinary farm crops. The average date of the last killing frost in spring is April 13, and the first in fall is October 23. The latest killing frost recorded came on May 25, and the earliest, on September 17. The average growing season allows cutting alfalfa four times and pasturing bluegrass until late in November. Fruit is sometimes injured early in spring when frost follows warm weather, but the crop is rarely a total failure. Frequently losses are caused more by lack of proper care of the orchards than by unfavorable climate. On the whole, the climate seems well suited to the type of general farming practiced.

SOILS OF ST. CHARLES COUNTY

The generalized soil map of St. Charles County shows 10 kinds of areas, or soil associations, in order that the soils may be more easily

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at St. Charles, St. Charles County, Missouri*

[Elevation, 490 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Total for the driest year	Total for the wettest year	Average snowfall
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	34.9	74	−19	1.79	0.62	1.16	2.9
January	31.0	77	−22	2.15	3.56	3.65	4.4
February	33.3	82	−24	1.99	1.85	1.66	5.9
Winter	33.1	82	−24	5.93	6.03	6.47	13.2
March	44.5	92	−2	3.17	1.29	8.79	3.6
April	55.6	90	17	3.75	1.05	4.70	.3
May	63.1	98	30	4.28	1.69	9.38	[3]
Spring	54.4	98	−2	11.20	4.03	22.87	3.9
June	73.9	104	41	4.00	3.31	8.59	0
July	78.1	112	50	2.99	[3]	6.99	0
August	76.8	109	45	4.24	.30	1.91	0
Summer	76.3	112	41	11.23	3.61	17.49	0
September	68.3	105	31	3.84	2.82	4.64	0
October	58.2	94	21	3.18	.62	3.55	[3]
November	45.3	85	7	2.11	1.95	2.13	1.0
Fall	57.3	105	7	9.13	5.39	10.32	1.0
Year	55.3	112	−24	37.49	[4] 19.06	[5] 57.15	18.1

[1] Average temperature based on a 66-year record, 1888 to 1953; highest and lowest temperatures from a 44-year record, 1887 to 1930.

[2] Average precipitation based on a 76-year record, 1878 to 1953; wettest and driest years based on a 53-year record, 1878 to 1930. Snowfall on a 41-year record, 1890 to 1930.

[3] Trace. [4] In 1930. [5] In 1898.

understood and remembered (fig. 5). Each association consists of soils that occur in a more or less regular geographic pattern; it is named for the dominant soils but normally contains other soils of minor extent.

The soils in one association may be much alike or greatly different from each other. The geographic pattern which the soils form determines the association, not the similarity or difference among the soils themselves. This pattern, however, may greatly influence the suitability of the soil association for agriculture. The type of farming followed on one association may be different from that used on another.

The 10 soil associations of this county have been divided into two groups—6 associations on the uplands, and 4 on the river bottoms.

Soil Associations of the Uplands

Menfro-Winfield (MW)

This association consists of brown soils that have developed in deep loess deposited on the "river hills." The soils are silty and have open friable subsoils. They are fertile, well drained, easy to till, and productive when well managed. Lime is generally needed for growing legumes. Soil erosion is a serious problem. This association covers the most highly developed agricultural upland area in the county—a more or less continuous band along the edge of both the Missouri and Mississippi Rivers.

Weldon-Union (WU)

This association occurs farther inland from the river bluffs than the Menfro-Winfield. The cover of loess is thin and occurs only on ridgetops and some of the gentle slopes. Weathered limestone bedrock is exposed on the steeper slopes.

The Weldon soils of this association have formed in the deposit of loess. They have a light-colored surface soil and a heavy, or fine-textured, subsoil. The Union soils—shallow and frequently stony—have developed from weathered limestone. They occur chiefly on the slopes and, in places, the surface layer of loess is lacking.

The soils of this association are less productive than those of the Menfro-Winfield. The corn acreage is small. Wheat and Korean lespedeza are the important crops.

Lindley-Marion (LM)

The Lindley soils and Marion silt loam are dominant in this association, but Weldon soils are included. The association occurs in the western part of the county. The Lindley soils have developed on the plastic glacial till, and the Marion and Weldon on loess.

The Lindley soils have a shallow light-colored surface soil and leached clay loam subsoil. The Marion soil has a very light-colored surface soil and a very dense, plastic, clay subsoil. As mentioned for the Weldon-Union association, the Weldon soils have a light-colored surface soil and a heavy slowly permeable subsoil. The Lindley soils are gently sloping to strongly sloping, the Weldon, gently sloping, and the Marion, nearly level.

The soils of this association have low productivity. They are used mainly for pasture, hay, or small grains.

Mexico (M)

This association occurs in the western part of the county on gently sloping to nearly level upland. The native vegetation was prairie grasses. The dominant soil (Mexico silt loam) has a darker surface soil than soils of the upland that have developed under forest, and its dense plastic subsoil is similar to that of the Marion soil. Small areas of Lindley, Weldon, and Union soils occur in this association.

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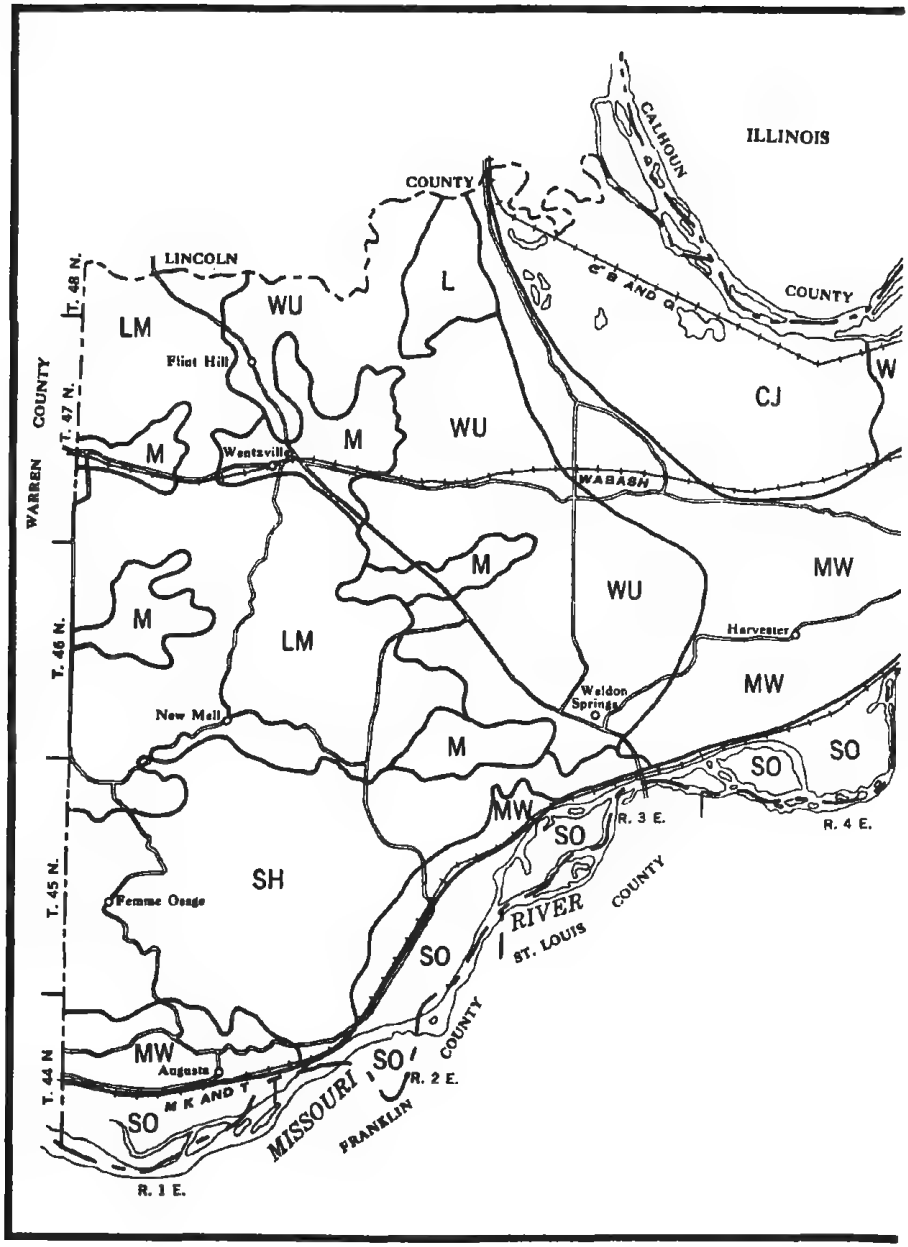
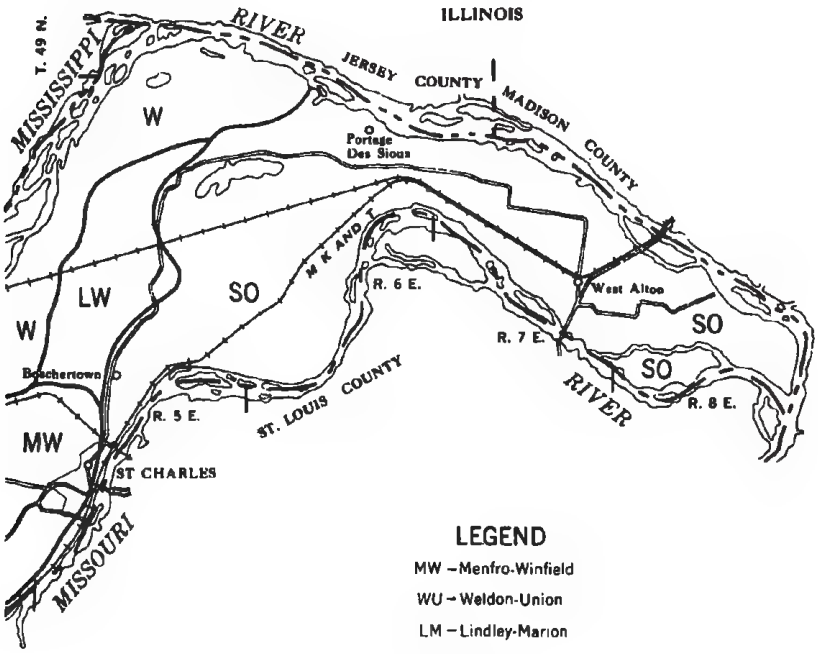


Figure 5.—Soil associations



of St. Charles County, Mo.

Leslie (L)

This association covers an area centered around St. Paul. The soils are similar to Mexico silt loam but they have a darker surface soil and a more open and permeable subsoil. Leslie silt loam is the dominant soil; it has developed on moderately deep loess under a mixed forest and prairie vegetation. This association is rather uniform. It includes small areas of Weldon and Union soils.

Steep stony land-Huntington (SH)

A large area of steep stony land in the southwestern part of the county has been placed in this association. Slopes are steep and the limestone-derived soil material is shallow and stony. Most of the farmland is on Huntington soils, which occur on alluvial deposits in the small stream bottoms. The Huntington soils are medium textured, brown in color, and well drained. They are highly productive but generally occur in small areas.

Soil Associations of the River Bottoms

Sarpy-Onawa (SO)

Varying quantities of moderately coarse textured and moderately fine textured soils make up this association that occurs on the bottom lands along the Missouri River. The Sarpy are the dominant sandy, or coarse textured soils; the Onawa are the principal moderately fine textured soils. The soils of this association are highly fertile.

Wabash clay (W)

This association covers the black clay bottoms; it is most extensive along the Mississippi River north and west of St. Charles. The principal soil is Wabash clay, known locally as gumbo. Most of the land is above overflow, but surface drainage is slow and drainage through the soils is very slow.

Lomax-Wabash (LW)

This association consists mainly of Lomax fine sandy loam, Wabash clay loam, and Wabash silt loam. All are deep, dark-colored soils of the bottom lands and are productive and intensively used. Most of the areas are above overflow.

Cuivre-Jacob (CJ)

This association consists of several thousand acres of gray bottom lands lying along the Mississippi River north and west of St. Peters. The gray medium-textured areas are called Cuivre silt loam, and the gray moderately fine and fine textured areas are the Jacob soils.

The soils of this association are mostly poorly drained and are subject to overflow. They have medium to low productivity.

USE, MANAGEMENT, AND PRODUCTIVITY OF THE SOILS

Soil Use

Land in farms accounted for about 79 percent of the county area in 1950. Cropland harvested in 1949 amounted to about 47.6 percent of all the land in farms. Table 2 gives the estimated percentage of each soil in cropland, pasture, forest, and land used for recreational purposes or left idle.

The grain-and-livestock type of farming widely practiced in the county is well adjusted to the capabilities of the soils. The management followed has attained the degree of stability that is characteristic of older, well-established agricultural communities.

The broad patterns of land use conform fairly well with the soil associations heretofore discussed (see p. 9 and fig. 5). The broad bottom lands (Sarpy-Onawa, Wabash clay, Lomax-Wabash, and Cuivre-Jacob associations) are used mainly for corn, wheat, and legumes.

The uplands in the west central part of the county (Menfro-Winfield, Weldon-Union, Mexico, and Leslie associations) are put to diversified uses, but wheat growing and dairying are most important. On the less productive uplands in the far western part of the county (Lindley-Marion association) the soils are used mainly for pasture, and livestock raising and dairying are the principal enterprises. The rough hilly upland in the southwestern part of the county (Steep stony land-Huntington association) is in forest and used mainly for woodlots and pasture.

Soil Management

The farmers of this county have recognized that the soils differ in their productivity and suitability for agriculture. This is evident from the large acreage of grassland in the western part and the concentration of grain crops on the productive bottom lands in the eastern part.

The principal management problems are maintenance of fertility and protection from erosion on the uplands, and drainage and protection from overflow on the bottom lands.

Lime and fertilizer

Practically all of the upland soils are very responsive to fertilizer. It is used on practically all of the wheat and most of the corn. The use of lime and fertilizer has greatly stimulated the growing of alfalfa and clover in the county. Generous applications of lime and fertilizer are necessary if grass or hay crops are to be established on eroded slopes. Upland pastures already established also need regular topdressings of lime and fertilizer if they are to produce high yields.

The soils of the bottom lands are high in organic matter and have large reserves of plant nutrients. Lime and fertilizer are not used so extensively on the bottom lands as on the uplands. Nitrogen fertilizer is extensively used on grain crops.

TABLE 2.—*Estimated land use in St. Charles County, Mo.*[1]

Soil	Percentage of soil area in—			
	Cropland	Pasture	Forest	Other uses [2]
Beaucoup clay	80	5	-------	15
Blockton silt loam, 0 to 1 percent slopes	80	20.	-------	-------
Bogota silt loam, 0.5 to 2 percent slopes	70	30	-------	-------
Burrell silt loam, 1 to 3 percent slopes	75	20	5	-------
Cuivre silt loam	55	10	-------	35
Dunning silt loam	60	40	-------	-------
Huntington silt loam	60	40	-------	-------
Huntington silt loam, colluvial variant, 1 to 5 percent slopes	70	30	-------	-------
Jacob clay	-------	-------	-------	100
Jacob silty clay loam	30	70	-------	-------
Leslie silt loam, 2 to 5 percent slopes	80	20	-------	-------
Lindley loam and clay loam, 2 to 6 percent slopes	50	35	-------	15
Lindley loam and clay loam, 7 to 12 percent slopes	20	80	-------	-------
Lomax fine sandy loam	100	-------	-------	-------
Marion silt loam, 1 to 3 percent slopes	20	35	20	25
Menfro silt loam and silty clay loam, 2 to 6 percent slopes	75	20	5	-------
Menfro silt loam and silty clay loam, 7 to 15 percent slopes	65	30	5	-------
Menfro silt loam and silty clay loam, 16 to 25 percent slopes	20	80	-------	-------
Mexico silt loam, 2 to 4 percent slopes	65	35	-------	-------
Onawa clay loam	95	5	-------	-------
Racoon silt loam, 0 to 1 percent slopes	80	20	-------	-------
Ray silt loam	80	20	-------	-------
Riley loamy fine sand	100	-------	-------	-------
Sarpy loamy fine sand	80	-------	-------	20
Sarpy very fine sandy loam	85	-------	-------	15
Sharon silt loam	65	35	-------	-------
Steep stony land, 15 to 35 percent slopes	-------	-------	100	-------
Union cherty silt loam, 8 to 20 percent slopes	-------	100	-------	-------
Union silt loam, 4 to 11 percent slopes	55	25	20	-------
Wabash clay	80	20	-------	-------
Wabash clay loam	90	10	-------	-------
Wabash silt loam	90	10	-------	-------
Weldon silt loam, 2 to 6 percent slopes	75	25	-------	-------
Weldon silt loam and silty clay loam, 7 to 11 percent slopes	65	35	-------	-------
Westerville silt loam	80	20	-------	-------
Winfield silt loam, 2 to 6 percent slopes	75	20	5	-------
Winfield silt loam and silty clay loam, 7 to 12 percent slopes	70	30	-------	-------

[1] Estimates obtained in 1939 and represent land use at that time; some changes in land use may have occurred since 1939.

[2] *Other uses:* Nonforested land used for recreational purposes and idle land (principally abandoned cropland); estimates do not take into account the land used for roads and urban developments.

Erosion

Erosion occurs on almost all the soils of the uplands; it is one of the most difficult problems to be met in improving or maintaining the soils. The brown soils derived from loess, such as the Menfro and Winfield, eroded easily. The natural erodibility of the loess material is enhanced by the sloping topography and by a type of farming that requires frequent cultivation.

Methods of erosion control such as terracing and planting of crops in strips and on contour lines cannot always be applied to areas where slopes are short, steep, and irregular. For these areas, selection of a suitable soil use or of a desirable cropping system is one of the first steps. Slopes should be kept under a permanent cover of grass or trees, or a cropping system should be followed that requires cultivation only at intervals of 4 to 6 years. All management practices that increase the density of the cover crop will tend to reduce runoff and the loss of soil. Arranging of fields according to length and steepness of slopes and reducing the size of large fields are useful ways of reducing runoff and erosion.

Drainage

A large part of the bottom land along the Mississippi River is not adequately drained because:

1. There are many broad nearly level areas.
2. The clay soils are slowly permeable.
3. Drainage waters from upland streams accumulate.
4. Floodwaters from the large rivers cover large areas.

The level surface of the bottom land along the Mississippi causes very slow runoff of all surface water. The heavy texture of the soils retards removal of water by subsoil drainage. During rainy periods large areas are covered by water, and frequently the land remains wet so long that crops cannot be planted or harvested at the proper time.

Reclamation of the bottom lands by means of open ditches might be possible, but, as yet, this does not seem either feasible or economically sound. Even if surface drainage were established, much of the land would be hazardous for farming. Tile drainage is not effective. Much of the poorly drained land is privately owned and used as hunting and fishing preserves.

Protecting the areas of bottom land along small streams from drainage water coming from the uplands is difficult. The channels of the streams tend to become silted where they enter the river bottoms. Levees have been built along Dardenne and Perique Creeks for only a short distance. During periods of high water, these streams inundate large areas. Wider use of silting basins to catch the silt carried by small streams during floods appears feasible. The sediment retained in a basin forms a very productive soil and slightly elevates the land surface. The alluvial fans that have formed where streams enter the river bottoms provide some of the most productive soil (Ray silt loam) in the county.

Most of the bottom land along the Mississippi and Missouri Rivers is occasionally flooded, but the Missouri River floods more frequently than the Mississippi. The Mississippi overflows only at extremely high

stages, but complete protection by levees has not yet been accomplished. At exceptionally high stages of the Missouri River, water may flow into the Mississippi near Portage des Sioux. Two former meander channels of the Missouri River—Marias Temps Clair and Marias Croche—contain water most of the time but are rapidly filling in and may eventually disappear.

Soil Productivity

The relative productivity of the various soils is indicated in table 3, which gives estimated average acre yields on the soils of the county under two systems of management. Management System I indicates the average level of management the particular soil received at the time of survey. Management System II shows the yields to be expected under a high level of management. In examining table 3, it will be noted that some soils yield about the same under both systems. This may indicate that yields are restricted by poor drainage or some other unfavorable condition beyond the control of the operator. It also may indicate that a soil has such high inherent fertility that the usual additions of fertilizer do not improve yields. Suggestions for management of the various soils are given in the section, Soil Types and Phases.

SOIL TYPES AND PHASES

The soils of St. Charles County are described in the following pages, and their use and management needs are discussed. Their location is shown on the soil map that accompanies this report, and their approximate acreage and proportionate extent are given in table 4.

Beaucoup Soil

Beaucoup clay (Ba)

Beaucoup clay occupies low bottom lands along the Missouri River. It is a dark-colored, nearly neutral, fine-textured soil, sometimes called gumbo, that frequently surrounds shallow lakes. In surface appearance it is similar to Onawa clay loam, but it differs in being underlain by several feet of clay. The Onawa soil is underlain by sand beginning at depths of about 2 to 3 feet.

Soil profile:

0 to 9 inches, gray to black clay; plastic when wet and granular when dry.
9 to 18 inches, olive-gray very plastic clay.
18 inches +, gray to light olive-gray very plastic clay.

In places the sandy material underlies the clay at depths of 4 to 6 feet. Lenses of sandy material may be encountered at any depth. The entire profile contains sufficient lime for growing legumes.

Use and management.—This soil is fertile but fine-textured, subject to overflow, and poorly drained in some places. When drained and protected from overflow, it is very productive for some crops. Wheat is grown extensively. Yields average about 20 bushels an acre. No soil treatments other than drainage and flood protection are used. This is not a good soil for corn, but alfalfa and soybeans can be grown successfully on the better drained areas.

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TABLE 3.—*Estimated acre yields of principal crops on the soils of St. Charles County, Mo., under two systems of management*

[Management System No. I.—Type of management followed at time of survey (1939): (1) Lime and fertilizer applied, but not in adequate amounts; normal application of fertilizer, 100 to 200 pounds an acre of 4–12–4 or the equivalent at the time of seeding the small grain; (2) legumes grown irregularly, not in planned crop rotations; (3) drainage of some soils as indicated in this table.

Management System No. II.—Type of management recommended at time of survey (1939): (1) Lime and fertilizer applied in amounts indicated by soils tests; (2) organic-matter content increased and part of nitrogen supplied by legumes, green-manure crops, or barnyard manure; (3) practice of drainage and erosion control as recommended in this table. Yields higher than those given under Management System II may be obtained under special management and soil conditions.]

Map symbol	Soil and management system	Supplementary drainage and erosion control practices [1]	Corn	Soybeans	Wheat	Clover	Alfalfa	Pasture
			Bu.	*Bu.*	*Bu.*	*Tons*	*Tons*	*Acres per cow* [2]
BA	Beaucoup clay:							
	I	Drainage	25	18	20	1.5	[3]	3
	II	Drainage	[4]	18	20	1.5	[3]	3
BB	Blockton silt loam, 0 to 1 percent slopes:							
	I	Not needed	40	20	20	1.5	[5]	3
	II	Not needed	60	25	25	2.0	2.5	2
BC	Bogota silt loam, 0.5 to 2 percent slopes:							
	I	Not needed	30	15	15	1.5	[6]	4
	II	Not needed	50	18	20	2.0	[6]	3
BD	Burrell silt loam, 1 to 3 percent slopes:							
	I	Not used	25	12	15	1.0	[6]	5
	II	Diversion terraces	[4]	15	20	1.5	[6]	3
CA	Cuivre silt loam:							
	I	Not used	25	15	15	1.0	[6]	5
	II	Surface drainage	40	18	18	1.5	[6]	3
DA	Dunning silt loam:							
	I	Not used	40	[5]	18	1.5	2.5	3
	II	Drainage	50	[7]	20	1.5	2.5	2

See footnotes at end of table.

TABLE 3.—*Estimated acre yields of principal crops on the soils of St. Charles County, Mo., under two systems of management*—Continued

Map symbol	Soil and management system	Supplementary drainage and erosion control practices [1]	Corn	Soybeans	Wheat	Clover	Alfalfa	Pasture
			Bu.	*Bu.*	*Bu.*	*Tons*	*Tons*	*Acres per cow* [2]
HA	Huntington silt loam:							
	I	Not needed	50	(3)	25	1.5	2.5	3
	II	Not needed	60	(7)	25	1.5	2.5	2
HB	Huntington silt loam, colluvial variant, 1 to 5 percent slopes:							
	I	Not used	40	(3)	20	1.5	2.0	3
	II	Diversion terraces	55	(7)	25	1.5	2.5	3
JA	Jacob clay:							
	I	Not needed	(8)	(8)	(8)	(8)	(8)	(8)
	II	Not needed	(8)	(8)	(8)	(8)	(8)	(8)
JB	Jacob silty clay loam:							
	I	Not used	20	(3)	12	1.0	(6)	4
	II	Drainage	(4)	18	15	1.5	(6)	3
LA	Leslie silt loam, 2 to 5 percent slopes:							
	I	Not used	40	(3)	25	1.5	(3)	4
	II	Contour and terrace	55	(7)	30	1.5	(7)	3
LB	Lindley loam and clay loam, 2 to 6 percent slopes:							
	I	Not used	20	(3)	10	.75	(6)	5
	II	Contour and terrace	40	(7)	15	1.25	(6)	4
LC	Lindley loam and clay loam, 7 to 12 percent slopes:							
	I	Not used	15	(3)	10	.5	(6)	5
	II	Contour and terrace	(4)	(7)	15	1.25	(6)	4
LD	Lomax fine sandy loam:							
	I	Not needed	60	25	25	1.5	2.5	(5)
	II	Not needed	70	25	25	1.5	2.5	(7)

MA	Marion silt loam, 1 to 3 percent slopes:								
	I	Not needed	15	(5)	12	.5	(6)		5
	II		30	(7)	18	1.25	(8)		3
MB	Menfro silt loam and silty clay loam, 2 to 6 percent slopes:								
	I	Not used	40	(5)	15	1.5	2.0		4
	II	Contour and terrace	60	(7)	28	1.5	2.5		2
MC	Menfro silt loam and silty clay loam, 7 to 15 percent slopes:								
	I	Not used	35	(5)	15	1.5	2.5		4
	II	Contour and terrace	50	(7)	25	1.5	2.5		2
MD	Menfro silt loam and silty clay loam, 16 to 25 percent slopes:								
	I	Not needed	30	(5)	12	1.5	2.5		4
	II		(4)	(7)	18	1.5	2.5		3
ME	Mexico silt loam, 2 to 4 percent slopes:								
	I	Not used	30	15	15	1.0	(6)		4
	II	Terrace	50	20	22	1.5	(8)		2
OA	Onawa clay loam:								
	I	Drainage	30	20	30	2.0	[9] 2.5		3
	II		40	20	30	2.0	[9] 2.5		2
RA	Racoon silt loam, 0 to 1 percent slopes:								
	I	Not needed	25	15	15	1.0	(6)		4
	II		40	20	25	1.5	(8)		3
RB	Ray silt loam:								
	I	Not needed	55	(5)	25	(5)	2.5		3
	II		75	(7)	25	(7)	2.5		2
RC	Riley loamy fine sand:								
	I	Not needed	35	15	18	1.0	(5)	(5)	
	II		45	18	20	1.0	(7)	(7)	
RD	Riverwash:								
	I	Not needed	(10)	(10)	(10)	(10)	(10)	(10)	
	II								
SA	Sarpy loamy fine sand: [11]								
	I	Not needed	30	15	18	1.5	2.5	(5)	
	II		45	18	18	1.5	2.5	(7)	

See footnotes at end of table.

TABLE 3.—*Estimated acre yields of principal crops on the soils of St. Charles County, Mo., under two systems of management*—Continued

Map symbol	Soil and management system	Supplementary drainage and erosion control practices [1]	Corn	Soybeans	Wheat	Clover	Alfalfa	Pasture
			Bu.	*Bu.*	*Bu.*	*Tons*	*Tons*	*Acres per cow* [2]
SB	Sarpy very fine sandy loam:							
	I	Not needed	50	20	25	1.5	3.0	(5)
	II		70	20	25	1.5	3.0	(7)
SC	Sharon silt loam:							
	I	Not needed	40	(5)	20	1.5	3.0	(5)
	II		60	(7)	20	1.5	3.0	(7)
SD	Steep stony land, 15 to 35 percent slopes:							
	I	Not needed	(12)	(12)	(12)	(12)	(12)	(12)
	II							
UB	Union silt loam, 4 to 11 percent slopes:							
	I	Not used	20	(5)	10	1.5	2.0	5
	II	Contour and terrace	35	(7)	18	1.5	2.0	3
UA	Union cherty silt loam, 8 to 20 percent slopes:							
	I	Not used	(13)	(13)	(13)	(13)	(13)	[14] 6
	II	Clearing						[15] 5
WA	Wabash clay:							
	I	Surface drainage	25	18	22	1.0	(6)	4
	II		(4)	18	25	1.5	(6)	2
WB	Wabash clay loam:							
	I	Not used	40	22	25	1.5	2.5	3
	II	Surface drainage	60	22	25	1.5	2.5	2
WC	Wabash silt loam:							
	I	Not needed	50	22	25	1.5	3.0	3
	II		65	22	25	1.5	3.0	2
WD	Weldon silt loam, 2 to 6 percent slopes:							
	I	Not used	30	(5)	18	1.0	(5)	4
	II	Contour and terrace	50	(7)	22	1.5	2.0	2.5

WE	Weldon silt loam and silty clay loam, 7 to 11 percent slopes:							
	I	Not used	20	(5)	10	1.0	(5)	5
	II	Contour and stripcrop	40	(7)	18	1.5	2.0	3
WF	Westerville silt loam:							
	I	Not needed	30	20	20	1.0	(5)	3
	II		50	20	20	1.5	(7)	2
WO	Winfield silt loam, 2 to 6 percent slopes:							
	I	Not used	35	(5)	18	1.0	2.0	4
	II	Contour	55	(7)	25	1.5	2.5	3
WH	Winfield silt loam and silty clay loam, 7 to 12 percent slopes:							
	I	Not used	25	(5)	15	1.0	2.0	4
	II	Contour, terrace, and stripcrop.	(4)	(7)	20	1.5	2.5	3

[1] Supplementary practices specified in this column are needed in addition to the practices defined in the headnote.

[2] Number of acres necessary to pasture 1 cow for the grazing season; 1 cow is considered equivalent to 7 sheep.

[3] Soil considered too poorly drained for alfalfa but will produce that crop successfully if drained.

[4] Crop specified is not recommended for this soil.

[5] Crop ordinarily is not grown on the soil under the management level specified.

[6] Little alfalfa is grown on the soil because of the heavy clay subsoil and the normally excessive wetness during winter and early in spring; stands are difficult to establish and are short lived.

[7] Data for yield estimates under improved management are not available because crop ordinarily is not grown under the prevailing system of management.

[8] At the time of survey this soil was used entirely as a wildlife refuge.

[9] Soil physically and chemically suited to alfalfa but danger of flooding limits use of this crop.

[10] Not suitable for agriculture.

[11] Yields variable because of overflow.

[12] Entirely in forest.

[13] Not suitable for cultivated crops and almost entirely in wooded pasture.

[14] Yield when not cleared.

[15] Yield when cleared.

TABLE 4.—*Approximate acreage and proportionate extent of the soils mapped in St. Charles County, Mo.*

Soil	Acres	Percent
Beaucoup clay	4, 862	1. 3
Blockton silt loam, 0 to 1 percent slopes	1, 072	0. 3
Bogota silt loam, 0 5 to 2 percent slopes	981	. 2
Burrell silt loam, 1 to 3 percent slopes	1, 841	. 5
Cuivre silt loam	5, 423	1. 4
Dunning silt loam	74	[1]
Huntington silt loam	4, 871	1. 3
Huntington silt loam, colluvial variant, 1 to 5 percent slopes	251	. 1
Jacob clay	7, 083	1. 9
Jacob silty clay loam	8, 209	2. 2
Leslie silt loam, 2 to 5 percent slopes	4, 139	1. 1
Lindley loam and clay loam, 2 to 6 percent slopes	2, 733	. 7
Lindley loam and clay loam, 7 to 12 percent slopes	17, 912	4. 8
Lomax fine sandy loam	9, 387	2. 5
Marion silt loam, 1 to 3 percent slopes	7, 111	1. 9
Menfro silt loam and silty clay loam, 2 to 6 percent slopes	6, 114	1. 6
Menfro silt loam and silty clay loam, 7 to 15 percent slopes	1, 925	. 5
Menfro silt loam and silty clay loam, 16 to 25 percent slopes	14, 750	3. 9
Mexico silt loam, 2 to 4 percent slopes	22, 138	5. 9
Onawa clay loam	24, 267	6. 5
Racoon silt loam, 0 to 1 percent slopes	1, 656	. 4
Ray silt loam	12, 719	3. 4
Riley loam fine sand	983	. 3
Riverwash	9, 551	2. 7
Sarpy loamy fine sand	848	. 2
Sarpy very fine sandy loam	21, 463	5. 7
Sharon silt loam	13, 026	3. 5
Steep stony land, 15 to 35 percent slopes	27, 034	7. 2
Union cherty silt loam, 8 to 20 percent slopes	13, 405	3. 6
Union silt loam, 4 to 11 percent slopes	24, 952	6. 7
Wabash clay	14, 342	3. 8
Wabash clay loam	6, 061	1. 6
Wabash silt loam	2, 585	. 7
Weldon silt loam, 2 to 6 percent slopes	15, 257	4. 1
Weldon silt loam and silty clay loam, 7 to 11 percent slopes	11, 694	3. 1
Westerville silt loam	5, 711	1. 5
Winfield silt loam, 2 to 6 percent slopes	9, 945	2. 6
Winfield silt loam and silty clay loam, 7 to 12 percent slopes	17, 324	4. 6
Water	20, 637	5. 5
Total	375, 040	[2] 99. 8

[1] Less than 0.1 percent.

[2] Small unmapped islands in river channel measure 767 acres and account for remaining 0.2 percent.

Blockton Soil

Blockton silt loam, 0 to 1 percent slopes (Bb)

Blockton silt loam, 0 to 1 percent slopes, occurs mainly on a very low terrace, or second bottom, along the edge of the large terrace that borders the Cuivre River northwest of St. Paul. It is dark-colored soil with a relatively heavy subsoil.

Soil profile:

0 to 14 inches, dark grayish-brown friable granular silt loam, acid in reaction.
14 to 18 inches, grayish-brown friable silt loam of coarse granular structure.

18 to 30 inches, dark grayish-brown plastic silty clay mottled with gray and brown; acid in reaction.
30 to 48 inches, gray and yellowish-brown mottled silty clay; slightly acid in reaction.

A few small areas near St. Peters that are not quite so fine in texture nor so gray in the subsoil were included with this soil in mapping.

Use and management.—Blockton silt loam, 0 to 1 percent slopes, is all in cultivation. Corn, small grains, and hay are the principal crops. The soil is productive when good management practices are followed. Lime is needed for most crops, and especially for legumes.

Bogota Soil

Bogota silt loam, 0.5 to 2 percent slopes (Bc)

Bogota silt loam, 0.5 to 2 percent slopes, occupies less than 2 square miles of nearly level upland. One area is near O'Fallon, and the other near St. Peters. The soil has formed on deep loess in association with the Winfield soils. The Winfield occupy the slopes, and Bogota soil the nearly level ridgetops.

Soil profile:

0 to 10 inches, light brownish-gray or yellowish-brown very friable fine granular silt loam; in a dry cultivated field, surface of this layer appears light gray.
10 to 18 inches, light-gray or very pale-brown very friable silt loam that contains numerous iron concretions.
18 to 22 inches, gray-and-brown mottled heavy silt loam or silty clay loam.
22 to 36 inches, yellowish-brown silty clay streaked with gray and brown.
36 to 48 inches, light-gray, yellowish-brown, and brown mottled, heavy silt loam.

The entire profile of this soil is acid. The soil is similar to the Winfield silt loams but it has more distinct soil horizons, is more leached, and is more poorly drained.

Use and management.—The nearly level topography and deep silty surface soil make cultivation easy. All areas are in cultivation and are used for small grains and clovers. Lime, phosphate, and potash fertilizers are needed for all crops. Some corn is grown. Corn yields about 30 bushels per acre under the management most farmers in the county are practicing.

Burrell Soil

Burrell silt loam, 1 to 3 percent slopes (Bd)

Burrell silt loam, 1 to 3 percent slopes, is a brownish-gray soil that occurs on gently sloping terraces in association with Racoon silt loam, 0 to 1 percent slopes. It does not have the gray subsurface layer found in the Racoon silt loam. It has a heavy, plastic subsoil, though not so heavy or compact as the Racoon subsoil.

Soil profile:

0 to 7 inches, light brownish-gray very friable silt loam of granular structure.
7 to 12 inches, light yellowish-brown very friable silt loam.
12 to 24 inches, mottled yellowish-brown, grayish-brown, and brown rather stiff, dense, silty clay.
24 to 40 inches, dominantly light yellowish-brown, mottled with brownish-gray, silty clay.

A few low mounds of sandy material along the Flat Woods road north of Whites Branch have been included with the Burrell soil as

it is shown on the map. Though the soils of these mounds are sandier and browner, they have been included with the Burrell soil because they cover such a small total area.

Use and management.—The Burrell soil is used for general farming. Only a small acreage of corn is grown. Small grains and Korean lespedeza are the principal crops. Lime and complete fertilizers are needed for large crop yields.

Erosion is a serious problem on this soil. Some areas receive runoff from adjacent higher land. Diversion terraces at the base of the upland may be needed to divert runoff from these areas.

Cuivre Soil

Cuivre silt loam (Ca)

Cuivre silt loam is a light-colored soil of the bottom lands along the Mississippi River. It has a silt loam surface soil and silty clay or clay subsoil. With the Jacob soils it occupies an area in the northern part of the county near the mouth of the Cuivre River.

Soil profile:

0 to 9 inches, light brownish-gray friable silt loam with a weakly developed fine granular structure.
9 to 16 inches, light gray, "ashy" silt loam of platy structure.
16 to 36 inches, yellowish-brown, gray, and grayish-brown mottled, very plastic clay or silty clay.

The soil is strongly acid throughout the profile. The topography is nearly level, and surface drainage is slow. Because of the dense clay or silty clay subsoil, permeability is very slow. Most areas are subject to occasional overflow. Nevertheless, surface drainage is better and flood hazard is less on the Cuivre soil than on the associated Jacob soil.

Use and management.—Extensive areas of Cuivre soil are used by hunting clubs. Much of the farming is done by caretakers. About two-thirds of the soil is in cultivation. The main crops are corn, wheat, and hay.

Corn and oat crops frequently fail in wet seasons. Corn yields are about 20 to 25 bushels an acre. Few soybeans are grown. Korean lespedeza grows well on this soil. Alsike clover does well if lime is used. Wheat is one of the most reliable crops. Cuivre silt loam needs lime and phosphate fertilizer for normal growth of crops.

Dunning Soil

Dunning silt loam (Da)

Dunning silt loam is a dark-colored soil of the bottom lands. It occurs in creek valleys in the places where limestone outcrops.

Soil profile:

0 to 12 inches, dark-gray friable silt loam with a well-developed granular structure.
12 to 30 inches, gray or olive-gray plastic silty clay.

The surface soil is usually slightly acid; the subsoil is nearly neutral. There is some variation in surface texture; the range is from loam to silty clay loam.

The Dunning soil is fertile. Some areas are rather poorly drained, however, and most areas are subject to occasional short periods of overflow.

Use and management.—Where drainage is adequate and danger of overflow is slight, the Dunning soil is used for corn, wheat, and red clover. Yields are fairly high. The less well drained areas are used for pasture. Bluegrass and white clover are well adapted.

Huntington Soils

The Huntington soils are deep, brown, and well drained. They occur on first bottoms in the small valleys that cut through regions where the upland soils are largely derived from limestone. The Huntington soils in this county are Huntington silt loam and Huntington silt loam, colluvial variant, 1 to 5 percent slopes.

Huntington silt loam (Ha)

Huntington silt loam is fertile, well-drained, and easily tilled. Most of it is in small valleys that are cut into small fields by stream channels. Most areas are subject to occasional flash floods. Serious damage can result from scouring by floodwaters if the land is plowed or bare of vegetation at the time of overflow.

SOIL PROFILE: The surface 12 to 14 inches is a brown or dark-brown very friable silt loam. Below the surface layer the soil grades into a reddish-brown friable silt loam, which is several feet thick. A few small areas have chert fragments scattered throughout the soil, and in places beds of chert gravel lie 3 to 4 feet beneath the surface. Near sandstone outcrops the surface soil may be sandy.

Use and management.—Corn, wheat, and clovers are extensively grown. Crop yields are good in seasons of little or no overflow. The average is about 50 bushels of corn and 25 bushels of wheat an acre. Some of the small valleys were in pasture. Because of its high fertility and favorable moisture conditions, this soil is especially well suited to bluegrass. Where the soil occurs in small valleys, or where it is subject to damaging overflow, pasture is a good use for this soil.

Huntington silt loam, colluvial variant, 1 to 5 percent slopes (Hb)

Huntington silt loam, colluvial variant, 1 to 5 percent slopes, has formed from material that was moved by sheet wash and soil creep and deposited at the bottoms of slopes in the valley of Femme Osage Creek. This colluvial soil is not of sufficient extent to be given a new series name, so it was designated as a variant of Huntington silt loam.

SOIL PROFILE.—The colluvial variant of Huntington silt loam has a surface layer that ranges from light-brown to dark-brown in color and from loam to silt loam in texture. The subsoil is brown or reddish brown and usually a little finer textured than the surface soil. Variable amounts of chert gravel may be present throughout the soil mass. A few poorly drained areas of small extent were included with the mapping unit.

Use and management.—This colluvial variant occurs as small areas adjacent to the bottom land and is farmed with the bottom-land soils. Corn, small grains, and clovers are the main crops. Yields average slightly below those obtained on Huntington silt loam. This colluvial

variant lies above the overflow level of the main streams, but runoff water from adjacent hills flows across some of the areas and creates a minor erosion hazard.

Jacob Soils

The Jacob are gray, heavy soils of the bottom lands. They are near the mouth of the Cuivre River in association with Cuivre silt loam. They differ from the Cuivre soil in having finer textured, slightly darker surface soils and in not having the light-gray subsurface horizon present in the Cuivre soil. The Jacob soils have lighter colored and thinner surface horizons than the Wabash soils.

Jacob clay (Ja)

Jacob clay occupies marshy land surrounding shallow lakes. The vegetation consists of swampgrasses and sedges. The soil is flooded for long periods every year, and the water table is seldom more than a foot or two below the surface.

Soil profile:

0 to 7 inches, gray clay mottled with dark-brown or rusty colored stains; very plastic when wet and breaks into coarse hard granules when dry.
7 to 20 inches, gray very plastic clay mottled with yellowish brown.
20 to 40 inches, uniformly colored gray or light-gray very plastic clay.

Use and management.—This soil is not cultivated. Cultivation has been attempted without success. Even with adequate drainage and flood protection, cultivation would be difficult and the yields low.

Nearly all areas of Jacob clay are owned by hunting clubs; it is unlikely that crop production will be attempted in the near future.

Jacob silty clay loam (Jb)

Jacob silty clay loam occupies rather extensive areas in the bottoms along the Mississippi River. It occurs in association with Jacob clay and Cuivre silt loam. Drainage is deficient, but overflow is less frequent than on the slightly lower lying Jacob clay.

Soil profile:

0 to 8 inches, gray silty clay loam; plastic when wet and forms coarse hard granules when dry.
8 to 30 inches, gray plastic clay mottled with yellowish brown.
30 to 40 inches, uniformly colored gray or light-gray very plastic clay.

Use and management.—Jacob silty clay loam was originally covered with a dense growth of coarse swampgrasses. About 30 percent of the soil has been plowed and is used for grain crops in favorable seasons. Corn and wheat are the principal crops. Corn yields 20 to 25 bushels an acre and wheat 10 to 15 bushels.

Leslie Soil

Leslie silt loam, 2 to 5 percent slopes (La)

Leslie silt loam, 2 to 5 percent slopes, occurs in a region of low relief north of St. Paul that is known locally as the Dog Prairie. The soil has formed from moderately deep loess that originally supported a mixed prairie-forest vegetation.

Soil profile:

0 to 12 inches, dark grayish-brown or dark-gray very friable silt loam.
12 to 20 inches, gray silt loam that crushes to a light yellowish-brown; horizon variable in thickness and distinctness.
20 to 32 inches, grayish-brown plastic or very firm silty clay loam mottled with yellowish brown.
32 to 48 inches, brownish-gray friable silty clay loam mottled with yellowish brown.
48 to 72 inches, light yellowish-brown heavy silt loam similar to the substratum of the Winfield silt loams.

Use and management.—Leslie silt loam, 2 to 5 percent slopes, is productive soil. It is extensively used for small grains, clovers, and corn. About 20 percent of it is in permanent pasture. Wheat yields 25 to 30 bushels an acre. Some fertilizer is applied to most grain crops.

Because of the restricted drainage and fine-textured subsoil, alfalfa is more difficult to establish and maintain on this soil than on the more open Menfro and Winfield soils. Red clover and sweetclover are well adapted, and lespedeza is widely grown. When the fertilizer needs of this soil are met, the management practices and crop rotations listed in table 5 apply.

TABLE 5.—*Desirable management practices and crop rotations for Leslie silt loam with a slope gradient of 4 percent* [1]

Farming or conservation practice	Maximum safe length of slope	Most intensive safe crop rotation
Soil farmed with field boundary.	300 feet	Row crop, fall-planted small grain, and grass-legume mixture for 2 years.
Soil farmed on the contour.	300 feet	Row crop, spring-planted small grain, and grass-legume mixture for 1 year.
Soil terraced and contour farmed.	No restriction on length.	Row crop, and spring-planted small grain followed by sweetclover to be plowed under.

[1] Smith, D. D., Whitt, D. M., and Miller, M. F., CROPPING SYSTEMS FOR SOIL CONSERVATION. Mo. Agr. Expt. Sta. Bul. 518.

Lindley Soils

The Lindley soils occur in the western part of the County. They are the following:

Lindley loam and clay loam, 2 to 6 percent slopes
Lindley loam and clay loam, 7 to 12 percent slopes

These light-colored soils have thin surface layers and fine-textured plastic subsoils. They have developed from glacial till—a mixture of gravel, sand, and clay deposited by glaciers. A mixed oak forest originally covered all of the Lindley soils.

The Lindley soils usually occur on moderately sloping hillsides below the Weldon or Marion soils of the ridgetops. Near larger streams, the steeper slopes below the Lindley soils may be occupied by Union soils or Steep stony land, 15 to 35 percent slopes.

Soil profile (uneroded Lindley soils):

0 to 3 inches, grayish-brown friable loam.
3 to 8 inches, pale-brown or light brownish-gray powdery or floury loam.
8 to 18 inches, yellowish-brown dense plastic sandy clay.
18 to 36 inches, yellowish-brown and gray mottled, plastic sandy clay.

Small pebbles are scattered throughout the soils. When cultivated the shallow grayish-brown surface horizon is mixed with the lighter colored subsurface layer. Because the Lindley soils occur on slopes and have a slowly permeable subsoil, erosion is a serious problem in cultivated fields.

Lindley loam and clay loam, 2 to 6 percent slopes (Lb)

The profile of Lindley loam and clay loam, 2 to 6 percent slopes, is much like that described above for Lindley soils. In cultivated fields, however, the shallow surface soil has been mixed with the subsurface layer. Most of the cultivated fields are eroded; the eroded areas are difficult to till and have low productivity.

Use and management.—About a third of Lindley loam and clay loam, 2 to 6 percent slopes, is in open or wooded pasture. Small grains and hay are the principal crops on the cultivated areas. Some land is idle. The acreage of corn is small, and yields are low, or less than 20 bushels an acre under the management practiced. Wheat is grown, and when fertilized, yields of 14 to 18 bushels are common. With the better management practices, much greater yields can be expected.

Korean lespedeza, redtop, and timothy are widely used for hay and pasture. The addition of lime is necessary for normal growth of all crops and is especially needed for legumes.

The prevention of further erosion is important. Erosion can be controlled on areas used for pasture or forest. Improvement of pastures by liming and fertilization will reduce erosion losses and increase the amount of forage produced. For areas that must be kept in crops, a rotation of small grains and hay might be feasible.

Treatments made on Lindley soil in Boone County, Mo., indicate the improvement in yield that may result from applying lime and fertilizer to permanent pasture. With no treatment, the soil yielded 2,516 pounds of forage, but with lime and 836 pounds of 0–12–12, it produced 5,960 pounds.[4]

Lindley loam and clay loam, 7 to 12 percent slopes (Lc)

Lindley loam and clay loam, 7 to 12 percent slopes, has about the same profile as that described above for Lindley soils. The surface soil averages slightly thinner.

Use and management.—Most of this soil is in pasture or forest. Areas that have been cultivated are badly eroded, and numerous gullies are present.

This soil is not suited to crops requiring tillage. Improving the pastures and woodlots is the best means of increasing its productivity. Small grains should be used primarily as a nurse crop in reseeding pastures or hay meadows.

[4] Yields reported by Arnold Klemme, Soils Extension Specialist, from plots on Erle Palmer farm, Boone County, Mo. (1948).

Lomax Soil

Lomax fine sandy loam (Ld)

Lomax fine sandy loam occurs on a high bottom between the Missouri and Mississippi Rivers. Most of the soil is above overflow. It is a dark and well-drained soil formed from sandy loam river deposits.

Soil profile:

0 to 18 inches, very dark-brown or dark-brown friable or very friable fine sandy loam.
18 to 36 inches, dark grayish-brown to brown loam; layer slightly sticky when wet.
36 to 40 inches, brown to yellowish-brown friable fine sandy loam.

The entire profile is slightly acid.

Use and management.—Lomax fine sandy loam is a very productive soil. It is well suited to any crop that is climatically adapted to the region. A considerable area is used for truck farming. The rest is used mostly for corn, wheat, alfalfa, or clovers. Yields of 70 bushels of corn and 25 bushels of wheat an acre are common. Little of the soil is used for pasture. Overhead irrigation is used on some of the truck-crop areas. As this soil is near the St. Louis market, it is probable that the acreage of truck crops will increase.

Marion Soil

Marion silt loam, 1 to 3 percent slopes (Ma)

Marion silt loam, 1 to 3 percent slopes, occupies narrow nearly level ridgetops in the western part of the county. It is a light-colored clay-pan soil that has formed under trees. Areas of Marion soil are known locally as "post oak ridgeland." The soil has developed on shallow very highly weathered loess that is underlain by glacial till.

Soil profile:

0 to 8 inches, light brownish-gray (moist) to light-gray (dry) loose silt loam.
8 to 14 inches, light-gray to white loose silt loam.
14 to 26 inches, gray and grayish-brown mottled, very plastic clay.
26 to 36 inches, brownish-gray and yellowish-brown mottled, silty clay; layer less dense than the one above.

The ridgeland south and east of the village of Femme Osage is included with the Marion silt loam but it appears to be somewhat more productive. This area is known locally as the "hickory flats".

Use and management.—Marion silt loam, 1 to 3 percent slopes, is a poor soil. It is low in fertility and its heavy clay subsoil tends to make it poorly drained in the spring and droughty in the summer. Because the slopes are gentle, erosion is not serious.

About 20 percent is in forest. Of the acreage cleared, about 20 percent is idle and covered with a sparse growth of briers, shrubs, weeds, and low-quality annual grasses. Most of the rest is used for pasture, meadow, and small grains. A limited acreage of corn is grown; but average yields are low, or less than 20 bushels an acre. Untreated pastures are poor.

Korean lespedeza will grow without treatment but produces low yields unless lime, phosphate, and potash are applied liberally. Lime and liberal applications of complete fertilizer are needed to obtain good yields of any crop.

Menfro Soils

Menfro soils, locally known as "river hill land", occupy a belt of upland bordering the Missouri and Mississippi River floodplains. The soils are the following:

Menfro silt loam and silty clay loam, 2 to 6 percent slopes
Menfro silt loam and silty clay loam, 7 to 15 percent slopes
Menfro silt loam and silty clay loam, 16 to 25 percent slopes

These soils have developed under forest vegetation from silty windblown materials called loess. They have the most favorable subsoil for plant growth of any of the upland soils in the county.

Soil profile:

0 to 8 inches, dark grayish-brown very friable silt loam.
8 to 18 inches, brown to yellowish-brown mellow silt loam of coarse granular structure; indistinct lower boundary.
18 to 30 inches, brown or yellowish-brown friable silty clay loam with a distinct subangular blocky structure.
30 to 40 inches, similar to the above horizon but becomes more silty with increasing depth.

The profile of the Menfro silt loams and silty clay loams is characterized by its rather uniform yellowish-brown color and by the absence of any sharp changes in texture throughout the soil.

The Menfro soils belong to the Gray-Brown Podzolic great soil group, (see p. 44). As is characteristic of this group, the Menfro soils normally have a low amount of organic matter. They have a medium to high supply of mineral nutrients such as phosphate and potash. They are somewhat low in lime, especially in the surface horizon. Menfro soils are deep and well drained and respond rapidly to good management.

Menfro silt loam and silty clay loam, 2 to 6 percent slopes (MB)

Menfro silt loam and silty clay loam, 2 to 6 percent slopes, occurs in small scattered areas on narrow rounded ridgetops throughout the area occupied by Menfro soils. Its profile is similar to that previously described for Menfro soils.

Use and management.—This soil originally supported a vigorous forest growth. Most of the gentle slopes have now been cleared. A rotation of corn, wheat, and red clover is widely used. Alfalfa is grown, but the acreage is greater on the Menfro soils with steeper slopes.

Although it is somewhat higher in nutrients than other upland soils of the county, this soil responds to applications of complete fertilizers. Regular and frequent additions of nitrogen in the form of manure, green manure, or fertilizer are essential for producing high yields of corn.

Corn usually follows clover or alfalfa. Under this system, corn yields of 60 bushels or more an acre are common. Corn probably averages slightly more than 50 bushels an acre on this soil in St. Charles County.

Erosion is a serious problem but it can be controlled to large extent. Table 6 gives crop rotations and supplemental water-control practices for gently sloping areas of Menfro and Winfield soils that have been found effective in reducing erosion.

TABLE 6.—*Recommended management practices and crop rotations for Menfro and Winfield soils* [1]

Farming or conservation practice	Slope		Most intensive rotation that can be used without serious erosion
	Percent	Maximum safe length	
		Feet	
Tilled in direction of field boundaries.	3–4	300	Row crop, fall-planted grain, and grass-legume mixture for 3 years.
	5–6	250	Fall grain followed by grass-legume mixture for 1 year.
Tilled on contour	3–4	300	Row crop followed by winter cover crop, row crop, fall-planted grain, and grass-legume mixture for 2 years.
	5–6	250	Row crop, fall-planted grain, and grass-legume mixture for 3 years.
Terraced and tilled on the contour.	3–4	(2)	Row crop and spring-planted grain followed by sweetclover to be turned under.
	5–6	(2)	

[1] Smith, D. D., Whitt, D. M., Miller, M. F., CROPPING SYSTEMS FOR SOIL CONSERVATION. Mo. Agr. Expt. Sta. Bul. 518.

[2] No limitation on length of slope.

The recommendations in table 6 apply where fertility needs have been fully satisfied. The rotations listed are those that afford the most intensive land use possible and still conserve the soil. Less intensive rotations with a higher percentage of meadow crops would, of course, be equally effective in conserving the soil.

Menfro silt loam and silty clay loam, 7 to 15 percent slopes (Mc)

The profile of Menfro silt loam and silty clay loam, 7 to 15 percent slopes, is similar to that described for Menfro soils (p. 30). The principal difference is in the depth of surface soil. Erosion has removed much of the surface soil from many sloping areas.

The topography is characterized by rounded hills that have a predominating slope of 6 to 15 percent. The slopes are relatively short, or mostly less than 400 feet long. The subsoil is open and friable, so water and plant roots readily penetrate to great depth.

Use and management.—The rolling topography and loose silty nature of the soil material make this mapping unit very susceptible to erosion. Cultivated slopes have lost part or all of the surface soil through erosion. The hazard of gully erosion is severe. Farmers have made a determined effort to keep the gullies under control, and to large extent have been successful.

The subsoil can be made productive by adding large amounts of fertilizer that contains nitrogen, phosphorus, and potassium and by providing organic matter. The organic matter is needed to loosen the subsoil, to improve its tilth, and to promote good air and water

relations. The subsoil responds to treatment and can be kept at a moderately high level of productivity if erosion is held within reasonable limits.

This soil can be used in much the same way as Menfro silt loam and silty clay loam, 2 to 6 percent slopes, but more grass and less corn should be used in the rotation as a means of maintaining organic matter and soil tilth and reducing the erosion hazard. Alfalfa-grass mixtures are well adapted and give high yields under good management.

Unless this soil is terraced and farmed on the contour, it should be used only for meadow or pasture. Small grains should be used principally as a nurse crop for establishing the meadow.

Menfro silt loam and silty clay loam, 16 to 25 percent slopes (Md)

Menfro silt loam, 16 to 25 percent slopes, has much the same properties as are described for the Menfro soils (p. 30), but its surface soil is generally thinner and its subsoil is slightly more porous and silty.

Use and management.—Most of this steeply sloping soil is in pasture or forest. Some areas are used for alfalfa. Rapid erosion is difficult to prevent when this soil is cultivated. It should be kept under permanent grass or forest.

Mexico Soil

Mexico silt loam, 2 to 4 percent slopes (Me)

Mexico silt loam has developed under prairie vegetation from shallow highly weathered loess. It has a grayish-brown silt loam surface soil and a dense clay subsoil. It occurs on broad gently sloping ridgetops in the western part of the county.

Soil profile:

0 to 8 inches, dark grayish-brown very friable granular silt loam.
8 to 12 inches, grayish-brown friable silt loam; weak granular structure.
12 to 14 inches, light yellowish-brown or pale-brown, friable, heavy silt loam.
14 to 22 inches, grayish-brown compact and very plastic clay mottled with strong brown and yellowish brown.
22 to 34 inches, grayish-brown, yellowish-brown, and light yellowish-brown very plastic clay.
34 to 48 inches, light-gray and yellowish-brown mottled, plastic silty clay that becomes slightly more friable with increasing depth.

In nearly level areas the subsurface layer may be a light gray and the soil properties approach those of the Putnam soils, which are commonly associated with the Mexico soils elsewhere in central Missouri. Near the eastern limit of the Mexico soils, or east of Wentzville, as well as on the prairie areas near Dardenne, the surface soil averages a little deeper and the subsoil is a little more open than farther west.

Use and management.—About a third of the Mexico soil is used for pasture. Corn, wheat, oats, and various meadow crops are grown. Korean lespedeza is widely used for summer pasture or for hay.

The fine-textured compact subsoil causes very slow penetration of air and water. During wet seasons the surface soil stays saturated a long time because of the very slow internal drainage. The soil is also susceptible to drought.

Where lime and heavy applications of complete fertilizer are used, corn will yield 70 bushels or more an acre in favorable seasons. Under good management wheat will produce up to 25 bushels an acre. If the soil is not treated, corn yields about 25 bushels, and wheat about 12 bushels.

Even on gentle slopes the Mexico soil is subject to severe erosion unless adequate management is applied. Eroded areas are difficult to manage and produce low yields.

Onawa Soil

Onawa clay loam (Oa)

Onawa clay loam is a dark moderately fine textured Alluvial soil of the river bottoms.

Soil profile:

0 to 12 inches, dark-brown or grayish-brown granular clay loam; neutral to very slightly acid; varies from about 10 to 26 inches in depth.
12 to 40 inches, yellowish-brown or light-brown fine sandy loam or loamy fine sand; sandy material is calcareous in most places.

The thickness and heaviness of the clay loam layer are variable because the soil was derived from recent alluvial deposits. Surface drainage is usually fairly good, but most areas are subject to occasional overflow. Some areas have a high water table during wet seasons.

Use and management.—All of this soil is in cultivation. Wheat, clover, and alfalfa are the principal crops. When there is no damage from overflow, yields are usually high. The average yield of wheat is about 30 bushels an acre. There is little evidence that this soil will respond to any commercial fertilizer other than nitrogen.

Racoon Soil

Racoon silt loam, 0 to 1 percent slopes (Ra)

Racoon silt loam, known locally as crayfish land or buckshot land, occurs on the second bottoms (terraces) along the Cuivre River and the larger creeks.

Soil profile:

0 to 8 inches, light-gray friable silt loam with a weak granular structure; cultivated fields appear almost white when dry.
8 to 18 inches, very light-gray or white very friable silt loam of platy structure.
18 to 28 inches, compact, grayish-brown and gray mottled, silty clay or clay subsoil.
28 to 40 inches, brownish-gray or gray rather plastic silty clay.

The entire profile is strongly acid. The heavy compact subsoil causes slow permeability of air and water.

Use and management.—During wet seasons the surface soil stays wet a long time because of the very slow internal drainage. Surface drains and diversion terraces designed to prevent hill water from flowing or seeping onto the soil will somewhat alleviate this wetness. Frost heaving is a serious problem. Partly because of the frost heaving and periods of wetness, alfalfa stands are difficult to maintain. Wheat and Korean lespedeza are the principal crops on Racoon silt loam, 0 to 1 percent slopes.

Because this soil is nearly level and has an easily tilled silty surface soil, its productivity can be improved. Suggestions for improvement:

1. Apply lime and fertilizer according to soil tests.
2. Provide liberal quantities of organic matter in the form of manure or green manure.
3. Furnish adequate surface drainage by use of surface drains or diversion terraces.
4. Use rotations that have a high proportion of crops that can grow on imperfectly drained soils of very slow permeability; that is, wheat, soybeans, grasses, or shallow-rooted legumes.

Ray Soil

Ray silt loam (Rb)

Ray silt loam, known locally as made land, consists of brown silty material overlying dark-colored heavier soil. It occurs along small streams and in the river bottoms near the point where the small streams enter the large valley. The brown silty material of the surface soil has been washed from the uplands.

SOIL PROFILE: The surface soil is a light-brown very friable silt loam that ranges from about 12 inches to several feet in depth. Beneath the surface layer is dark-colored material, heavy textured in most places, that represents a buried soil of the bottom lands.

Use and management.—The Ray soil is very productive where it is not subject to frequent overflow and drainage has been provided. Most of it is used for corn, though some alfalfa is grown. Corn yields of 60 to 75 bushels an acre are common.

Riley Soil

Riley loamy fine sand (Rc)

Riley loamy fine sand is a dark-colored sandy soil of the high bottoms. The principal area is near Black Walnut between the Missouri and Mississippi Rivers. The soil is subject to overflow only during extremely high floods. It has a shallower surface layer and is more sandy than the Lomax soil. It differs from the Sarpy soils in being darker colored and noncalcareous. The surface is hummocky, which indicates movement of the sandy material by the wind.

Soil profile:

0 to 10 inches, dark grayish-brown very friable to loose loamy fine sand; neutral to slightly acid.

10 to 28 inches, brown to dark yellowish-brown very friable to loose loamy fine sand; neutral to slightly acid.

28 inches to many feet, yellowish brown very friable or loose loamy fine sand to sand; neutral in reaction.

Textures range from fine sandy loam to loamy sand in areas less than an acre in size. Some small blowouts occur in the sandier areas.

Use and management.—The Riley soil is essentially safe from overflow. It is somewhat excessively drained and has a rather low water-holding capacity. The low water-holding capacity is partially offset by a very deep rooting zone from which plants obtain moisture. The soil is moderately fertile and easily tilled. If the surface is bare, wind erosion may be serious in winter and early in spring.

The Riley soil is used for general farming. The emphasis is on small grains rather than corn. Frequent additions of organic matter and complete fertilizer are necessary to maintain yields.

Riverwash (Rd)

Riverwash consists of recent alluvial deposits. It occurs mostly along the Missouri River as bars or islands that are exposed only at low water stages. The areas are flooded frequently and material is added or removed every year. Riverwash is predominantly sandy, but the texture varies. When first formed, the areas have no vegetation, but they quickly become covered by a dense growth of willows and cottonwoods.

Use and management.—Riverwash is generally nonagricultural land, but some areas—especially those attached to the mainland—may be used for pasture during periods of low water.

Sarpy Soils

Sarpy soils occur on sandy first bottoms along the Missouri River. They are fertile and well drained but are subject to occasional overflow. The Sarpy soils mapped in this county are:

Sarpy loamy fine sand
Sarpy very fine sandy loam

Sarpy loamy fine sand (Sa)

Sarpy loamy fine sand is made up of recent sandy deposits laid down by the Missouri River during high floods. Most areas are near the river bank. The soil is a yellowish-brown loamy fine sand to fine sand. Like most recent river deposits, it is variable in the surface layer and throughout the soil profile. The boundaries may change when the Missouri River overflows. Each flood may form new areas or cover some of the older ones.

Use and management.—Because it contains much sand, crops on this soil are harmed more quickly by drought than on the medium-textured soils. Truck crops such as melons do well. Some areas are used for melons; most of the others are planted to wheat.

Sarpy very fine sandy loam (Sb)

Sarpy very fine sandy loam is a recent alluvial deposit left by the Missouri River. It has a yellowish-brown to grayish-brown mellow surface soil of very fine sandy loam that reaches to depths of 12 to 15 inches or more. The subsoil is a slightly lighter brown silt loam to loamy fine sand.

Like nearly all Sarpy soils, this one is covered by water during every major flood of the Missouri River. Each flood may deposit slightly different sizes of material, so there are numerous minor variations, especially in texture. The surface is slightly undulating.

Use and management.—This is one of the most productive soils in the county; it is adapted to a wide range of crops. Corn, wheat, oats, alfalfa and other legumes, and truck crops all can be grown successfully.

The soil is neutral in reaction. Corn usually makes a good response to nitrogen fertilizer. If nitrogen is applied, corn commonly yields 60 to 80 bushels an acre in good seasons. The corn yield averages about 50 bushels an acre.

Sharon Soil

Sharon silt loam (Sc)

Sharon silt loam has developed on recent alluvium that was deposited on the flood plains of small streams in the western and northern parts of the county.

SOIL PROFILE: The soil is a uniformly brown to grayish-brown silt loam. Little profile development is apparent but the material below 16 inches is usually slightly lighter in color.

Surface and internal drainage are good, but most areas are subject to frequent floods. The floods last only a short time and do comparatively little damage if they do not come in the growing season.

Use and management.—Most of this soil is used for corn, though some of the smaller valleys are in pasture. Most of the soil is farmed along with the surrounding hill land.

The average yield of corn is about 40 bushels an acre, if the crop is not damaged or destroyed by floods. Additions of nitrogen in the form of green manure or commercial fertilizers are needed for maximum yields of corn.

Steep stony land, 15 to 35 percent slopes (Sd)

About 50 square miles of steep stony land occurs in the southwestern part of the county. Cherty limestones are the most extensive rock formations exposed, but cherty dolomites and sandstones also occur. The soil material in this area is light-colored, shallow, and stony. The amount of stone in the surface soil and the depth to bedrock vary considerably, but the following describes a profile typical of a large part of this mapping unit.

0 to 6 inches, grayish-brown, pale-brown, or yellowish-brown silt loam containing varying amounts of stone.
6 to 12 inches, brown or reddish-brown stony silty clay loam.
12 inches to several feet, partially weathered limestone and chert; some reddish-brown soil material occurs in crevices of the limestone.

Use and management.—Nearly all of this land supports a mixed oak and hickory forest. It is of low value for pasture and is best suited to forestry.

Union Soils [5]

The Union soils are light-colored forested soils that have developed in thin loess over cherty limestone. They commonly occur on lower

[5] In a recent definition of the Union series, recognition is given to the presence of a weakly or moderately developed compact or cemented layer (fragipan) at the contact of the loess and limestone. Associated with this kind of profile is a profile consisting essentially of silty clay layers that have formed from weathered limestone material. In St. Charles County, both profiles are present in the areas mapped as Union. It is estimated that the areas with the compact layers are dominant, but the descriptions of the mapping units that follow do not clearly indicate this condition.

slopes in the western part of the county in association with the Lindley and Weldon soils.

The Union soils in this county are:

Union silt loam, 4 to 11 percent slopes.
Union cherty silt loam, 8 to 20 percent slopes.

Union silt loam, 4 to 11 percent slopes (Ub)

Union silt loam, 4 to 11 percent slopes, is almost stone-free in the surface and upper subsoil but very stony in the lower subsoil.

Soil profile:

0 to 7 inches, light-brown or grayish-brown friable silt loam.
7 to 12 inches, brown slightly plastic or hard silty clay loam.
12 to 24 inches, brown plastic silty clay.
24 to 30 inches, brown to reddish-brown cherty or stony silty clay.
30 inches to several feet, reddish-brown, very cherty or flinty silty clay.

The soil resembles the Weldon soils in the upper part of the profile but differs from them in the lower part. The lower part of the Weldon profile is stone-free and yellowish gray throughout.

Use and management.—All of the Union soil originally had a forest cover, mostly a mixed stand of white, red, and bur oaks, maple, elm, and hickory. Approximately 20 percent of the soil is still forested, and 20 to 30 percent is in permanent pasture. Most of the cultivated land is used for small grains, mainly wheat, or for Korean lespedeza. Corn is not well suited to this soil, and only a small acreage is planted.

Many of the steeper slopes are too stony to be cultivated and are in pasture. Forage yields can be increased greatly by renovation, which includes liming, fertilization, disking, and reseeding.

Union cherty silt loam, 8 to 20 percent slopes (Ua)

Union cherty silt loam, 8 to 20 percent slopes, occurs in the same region as Union silt loam, 4 to 11 percent slopes, but normally has steeper relief. Some stones occur in the surface layer and subsoil, and very stony material underlies the soil.

SOIL PROFILE: The surface layer consists of yellowish-brown silt loam that contains variable amounts of stone and continues to depths of 6 to 12 inches. This layer grades into a brown or reddish-brown plastic cherty silty clay. Below depths of about 24 to 36 inches the soil is very stony.

Use and management.—Rolling to hilly relief, steep slopes, and high stone content make this soil unsuitable for cultivation. Almost all of it is in pasture that includes a few scattered trees and shrubs. From 5 to 6 acres is required to carry a cow through the grazing season.

When cultivated, the soil erodes very rapidly. Even pastures erode unless they have a dense grass sod. Liming and fertilizing are important because they increase forage yields and reduce the erosion hazard by thickening the sod cover. Controlled grazing to prevent deterioration of sod is important on this relatively shallow soil.

Wabash Soils

Wabash clay (Wa)

Wabash clay is known locally as gumbo or black stick. The largest area in the county is in the Mississippi River bottom east of Dar-

denne Creek. The soil has poor surface drainage unless open ditches are used but it is rarely flooded. Internal drainage is slow.

Soil profile:

0 to 12 inches, very dark-gray to black clay; very plastic when wet but breaks into small hard granules when dry.
12 to 20 inches, very dark-gray very plastic clay.
20 to 40 inches, gray to dark-gray very plastic clay.

The soil is very uniform in color and texture but becomes slightly less heavy, or fine textured, where it adjoins Wabash silty clay loam. Near the boundary between the Wabash and Jacob soils, the Wabash soils are somewhat lighter colored.

Use and management.—This soil is difficult to till but highly fertile. With good management, it may produce abundant yields of adapted crops.

Soybeans are well adapted. High yields of rice have been obtained on similar soils in Lincoln County, Mo. Wheat and winter barley produce high yields in some years but are sometimes severely damaged by frost heaving or by excess moisture late in winter or early in spring. Oats are well adapted, but because it is difficult to prepare a seedbed on this soil early in spring, the acreage is limited. Corn is extensively grown, though yields are variable because of weather.

Red clover makes good growth, but stands are difficult to establish. Alsike and sweetclover seedlings also fail in some years. Korean lespedeza consistently does well.

Wabash clay loam (Wb)

Wabash clay loam occurs in the Mississippi River bottom bordering areas of Wabash clay. It contains less clay than Wabash clay but is finer textured than Wabash silt loam.

Soil profile:

0 to 12 inches, very dark-gray to black clay loam; plastic when wet and breaks into small hard granules on drying; not so plastic as Wabash clay.
12 to 20 inches, dark-gray very plastic clay flecked with rust-brown stains.
20 to 40 inches, gray to dark-gray very plastic clay.

Use and management.—Almost all of Wabash clay loam is in cultivation. It is better suited to corn than Wabash clay. Soybeans, wheat, and oats are all suitable. All crops have slightly higher average yields than on Wabash clay. Red clover seedings "catch" more frequently and survive the winter better.

Wabash silt loam (Wc)

Wabash silt loam is a dark-colored soil of the Mississippi River bottoms. It has a medium-textured surface soil and dense fine-textured subsoil.

Soil profile:

0 to 16 inches, very dark grayish-brown to black friable silt loam or loam of granular structure.
16 to 24 inches, dark grayish-brown plastic silty clay.
24 to 48 inches, dark-gray very plastic silty clay or clay.

Use and management.—Wabash silt loam is highly productive and is almost all in cultivation. Because of its heavy substrata, deep-

rooted crops such as alfalfa do not grow so well as on the more open Lomax and Sarpy soils. Nevertheless, some alfalfa is grown. The soil is well suited to all other crops commonly grown in this region. Most areas are above overflow.

Weldon Soils

Weldon soils have a grayish-brown surface soil and a yellowish-brown subsoil. They have developed from loess under forest vegetation. They resemble the Winfield soils but have a grayer surface soil and heavier subsoil. The loess is shallower and more highly weathered than in the regions occupied by Winfield or Menfro soils.

Soil profile:

0 to 8 inches, grayish-brown very friable silt loam of granular structure.
8 to 12 inches, pale-brown or light yellowish-brown heavy silt loam.
12 to 22 inches, yellowish-brown moderately plastic silty clay of coarse granular or blocky structure.
22 to 30 inches, yellowish-brown plastic silty clay loam mottled with very pale brown.
30 to 40 inches, mottled light brownish-gray and dark yellowish-brown slightly plastic silty clay loam.
40 inches+, mottled light brownish-gray and dark yellowish-brown heavy silt loam that may extend to depths of several feet.

The depth to mottling in the subsoil varies from about 18 to 28 inches. The subsoil generally becomes heavier and more plastic with increasing distance from the river bluffs.

Weldon silt loam, 2 to 6 percent slopes (Wd)

Weldon silt loam, 2 to 6 percent slopes, occurs on narrow rounded ridgetops. Its profile is the same as that described for Weldon soils.

Use and management.—This soil has moderately low fertility. Lime, phosphorus, and nitrogen must be supplied if crop production is to be successful. The nitrogen can be supplied in the form of manure, green manure, or commercial fertilizers.

Except where the ridges are too narrow to be used separately, most of this gently sloping soil is used for crops. Wheat and Korean lespedeza are both important. The corn acreage is small, and yields of 40 to 50 bushels an acre are obtained in favorable years. Red clover and alfalfa are grown to some extent, but not on so great an acreage as on the Winfield soils.

This Weldon soil has a subsoil heavy enough to restrict internal drainage, so runoff and erosion are serious. Eroded areas are difficult to farm and have low productivity.

Table 7 gives suitable management and crop rotations for Weldon soil that has been properly fertilized.

Weldon silt loam and silty clay loam, 7 to 11 percent slopes (We)

Weldon silt loam and silty clay loam, 7 to 11 percent slopes, has a profile similar to the one described above for Weldon soils. Its surface soil averages somewhat shallower, mostly because of erosion, and the light-colored subsurface layer is not so distinct.

TABLE 7.—*Suitable management practices and crop rotations for Weldon soil on slopes of 4 percent* [1]

Farming or conservation practice	Maximum safe length of slope	Most intensive safe crop rotation
Soil farmed with field boundary.	300 feet	Row crops, fall-planted small grain, grass-legume mixture for 4 years.
Soil farmed on contour	300 feet	Row crop, spring-planted small grain, and grass-legume mixture for 2 years.
Soil terraced and contour farmed.	No restriction on length.	Row crops, and spring-planted small grain followed by sweetclover to be plowed under.

[1] Smith, D. D., Whitt, D. M., and Miller, M. F. CROPPING SYSTEMS FOR SOIL CONSERVATION. Mo. Agr. Expt. Sta. Bul. 518.

Use and management.—Between 30 and 40 percent of this soil is in pasture, which ranges from fair to poor in quality. Wheat and Korean lespedeza were the most important crops.

Under cultivation, the erosion hazard is very high. Some fields are severely gullied and difficult to cultivate.

The soil has low fertility. Heavy applications of lime and fertilizer are required to obtain satisfactory yields of field crops or pasture.

Westerville Soil

Westerville silt loam (Wf)

Westerville silt loam occurs in first bottoms along the larger creeks. It is not so well drained as the Sharon soil and is therefore somewhat inferior to it.

Soil profile:

0 to 10 inches, grayish-brown very friable silt loam.
10 to 20 inches, pale-brown to light-gray silt loam that has rust-colored stains and contains some iron concretions, or "buckshot."
20 to 36 inches, brownish-gray silty clay loam mottled with yellowish brown.

The soil varies considerably in thickness and distinctness of the lighter colored subsurface layer and in depth to the subsoil. The subsurface layer ranges from 10 to 20 inches in thickness, and the subsoil may begin 16 inches from the surface or as far down as 30 inches.

Use and management.—Westerville silt loam is productive but not so productive as Sharon silt loam. Most areas are subject to occasional overflows of short duration.

Most of the soil is in cultivation. Corn, wheat, oats, Korean lespedeza, and alsike clover are the principal crops. Wheat produces 18 to 25 bushels an acre under ordinary management. Corn yields less than on the Sharon soil, or probably about 40 bushels an acre. In favorable seasons much higher yields can be obtained.

Winfield Soils

The Winfield soils have a dark-grayish-brown surface layer and a yellowish-brown, mottled, moderately heavy subsoil. The Winfield soils mapped in this county are:

Winfield silt loam, 2 to 6 percent slopes
Winfield silt loam and silty clay loam, 7 to 12 percent slopes

The soils have developed from a deep deposit of loess under a forest cover in the "river hills." They are slightly more weathered than the Menfro soils with which they are associated, and also have more distinct horizons. The subsoils are not so heavy as those of the Weldon soils.

Soil profile:

0 to 10 inches, grayish-brown very friable silt loam.
7 to 12 inches, brown very friable silt loam of fine granular structure.
12 to 28 inches, yellowish-brown slightly plastic silty clay loam of blocky structure.
28 to 40 inches, mottled light brownish-gray and yellowish-brown silty clay loam that grades into a silt loam at a depth of about 38 inches.

When dry, the subsoil breaks into small weakly developed blocky aggregates that show brown stains. When the aggregates are crushed, the subsoil material has a lighter color.

Winfield silt loam, 2 to 6 percent slopes (Wg)

The profile of Winfield silt loam, 2 to 6 percent slopes, is the same as the one described above for Winfield soils. The soil occurs on gentle slopes, principally on narrow rounded ridgetops.

Use and management.—Most of the gentle slopes have been cleared of forest and are cultivated. Corn, wheat, and red clover, grown in a 3-year rotation, are the principal crops. The yield for corn averages slightly lower than on the Menfro soils. Alfalfa is grown, but the acreage is not so large as on the Menfro soils. Wheat yields about the same as on the Menfro soils.

This soil is erodible, but slight erosion does not prevent its use for cultivated crops. It has good internal drainage and is moderately fertile. The conservation practices and rotations given in table 6 apply to this soil.

Winfield silt loam and silty clay loam, 7 to 12 percent slopes (Wh)

Winfield silt loam and silty clay loam, 7 to 12 percent slopes, has essentially the same soil profile as that described for Winfield soils. The principal differences are the result of greater erosion on this more sloping soil. In spots, most of the surface soil has been lost.

Use and management.—Permanent pasture and forest occupy about 30 percent of this soil. Most of the forested land is pastured. The pastures generally are not so good as on the Menfro soils, but better than on the Lindley, Weldon, or Union soils. Liming and fertilizing pastures or hay meadows according to needs shown by soil tests will greatly increase their carrying capacity or yield of hay.

Corn is grown on only a small acreage, and yields generally are low. Intertilled crops are not suitable for this soil, because erosion is difficult

to control. A crop rotation consisting of a small grain followed by hay or pasture is best suited.

MORPHOLOGY, GENESIS, AND CLASSIFICATION OF SOILS

Soils are complex natural bodies resulting from the interaction of the forces of climate, vegetation, parent material, and relief (or slope) through periods of time. The soils of this county differ because of differences in parent material, relief and attendant variation in drainage, vegetation, and age. The climate throughout the county is relatively uniform, so it cannot account for broad differences among the soils.

Factors of Soil Formation as Related to St. Charles County

The soil-forming materials in this county are loess, clayey glacial till, and weathered limestone residuum. Cherty limestone outcrops extensively in the southwestern and northwestern parts of the county. Kansan till covers the limestone rocks throughout the west-central part. Loess deposits are extensive throughout the county. Near the river valleys, the source of most of the loess, the deposit is deep and covers all but the steepest slopes. Farther back from the rivers the loess thins and occurs only as a capping on the ridgetops. As the layer of loess becomes thinner, the soils derived from it become heavier textured and their various horizons become more highly developed. The differences in degree of development among some soils derived from loess are indicated in tables 8, 9, and 10.

Within any region of the county, no matter what the kind of parent material, the soils on the level ridgetops are heavier and more highly

TABLE 8.—*Mechanical and chemical analyses of Menfro silt loam* [1]

[Profile taken in a cultivated field on a narrow slope of 3 percent gradient]

Depth	Clay (less than 0.002 mm.)	Exchange capacity	Exchangeable hydrogen	Base saturation	Organic matter	pH
Inches	*Percent*	*Milliequivalents per 100 grams*	*Milliequivalents per 100 grams*	*Percent*	*Percent*	
0–5	9.9	6.5	1.3	80	1.6	7.2
5–10	10.5	7.2	5.2	18	.9	6.2
10–18	18.8	8.4	7.2	14	.3	4.7
18–24	25.4	12.9	10.9	16	.5	4.8
24–30	29.6	14.3	11.4	20	.3	4.8
30–36	31.2	16.4	10.0	39	.2	5.2
36–40	30.7	20.7	10.8	48	.1	5.2
40–48	27.7	16.5	9.4	43	.2	5.3
48–60	25.8	17.4	9.8	49	.2	5.4
60–72	24.9	17.4	7.7	56	.1	5.5
72–84	23.0	17.0	7.2	58	0	5.9
84–88	21.6	----------	----------	--------	0	5.8

[1] Unpublished data from Missouri Agricultural Experiment Station.

developed than those on the slopes. The Bogota soil, for example, has more distinct horizons than the Winfield soil that surrounds it. Level upland areas are of limited extent in the county, so the area of soils that show the effect of level topography is small.

The soils that developed under prairie vegetation are darker colored and deeper than those that developed from similar material under forest.

TABLE 9.—*Mechanical and chemical analyses of Weldon silt loam* [1]

[Profile taken in a bluegrass pasture on slope of 3 percent gradient]

Depth	Clay (less than 0.002 mm.)	Exchange capacity	Organic matter	pH
Inches	*Percent*	*Milliequivalents per 100 grams*	*Percent*	
0–12	13. 7	7. 9	1. 5	4. 7
12–18	14. 7	6. 7	. 6	5. 1
18–24	42. 9	24. 5	. 1	5. 2
24–36	33. 8	18. 1	----------	6. 0
36–48	27. 6	16. 1	----------	6. 2
48–60	24. 1	16. 1	----------	6. 8
60–72	26. 0	13. 6	----------	6. 8

[1] Data from thesis submitted by W. D. Shrader as partial requirement for Master's degree, University of Missouri, 1941.

TABLE 10.—*Mechanical and chemical analyses of Winfield silt loam* [1]

[Profile taken in forest area on slope of 5.5 percent gradient]

Depth	Clay (less than 0.002 mm.)	Exchange capacity	Exchangeable hydrogen	Base saturation	Organic matter	pH
Inches	*Percent*	*Milliequivalents per 100 grams*	*Milliequivalents per 100 grams*	*Percent*	*Percent*	
0–1½	13. 9	11. 85	4. 5	62. 0	4. 8	6. 0
4–7	13. 9	8. 24	6. 2	24. 8	. 7	4. 6
9½–12	15. 2	8. 41	4. 7	44. 1	. 4	4. 6
15–18	16. 3	9. 11	4. 6	49. 5	. 2	4. 6
21–24	24. 5	15. 81	6. 3	60. 2	. 1	4. 7
27–30	36. 0	24. 99	8. 6	65. 6	. 2	4. 4
34–37	32. 4	----------	7. 4	----------	0	4. 9
45–50	26. 3	19. 79	3. 2	83. 8	0	6. 0
54–61	24. 0	19. 55	1. 8	90. 8	0	7. 1
65–78	19. 8	16. 52	1. 2	92. 7	. 1	7. 5

[1] Unpublished data from Missouri Agricultural Experiment Station.

Classification of Soils

The soils of St. Charles County are classified by soil orders and great soil groups in table 11. These groups, and the soils they include, are briefly discussed in the following pages.

TABLE 11.—*Soils of St. Charles, Mo., classified by orders and great soil groups*

Great soil group	Physiographic position	Parent material	Soil
Zonal Soils			
Gray-Brown Podzolic	Uplands	Loess	Menfro.
	Uplands	Loess	Winfield.
	Uplands	Loess	Weldon.
	Uplands	Glacial till	Lindley.
	Uplands	Residuum from limestone.	Union.
Gray-Brown Podzolic—Planosol intergrade.	Uplands	Loess	Bogota.
Prairie (transition to forest)	Uplands	Loess	Leslie.
Prairie	Terraces	Alluvium	Blockton.
	Terraces	Alluvium	Riley.
	Terraces	Alluvium	Lomax.
Intrazonal Soils			
Planosol (forested)	Uplands	Loess	Marion.
	Terraces	Alluvium	Racoon.
	Terraces	Alluvium	Burrell.
Planosol (prairie)	Uplands	Loess	Mexico.
Humic Gley	Bottoms	Alluvium	Dunning.
	Bottoms	Alluvium	Wabash.
Low-Humic Gley	Bottoms	Alluvium	Beaucoup.
	Bottoms	Alluvium	Jacob.
Azonal Soils			
Alluvial	Bottoms	Alluvium	Onawa.
	Bottoms	Alluvium	Cuivre.
	Bottoms	Alluvium	Huntington.
	Bottoms	Alluvium	Ray.
	Bottoms	Alluvium	Riverwash.
	Bottoms	Alluvium	Sarpy.
	Bottoms	Alluvium	Sharon.
	Bottoms	Alluvium	Westerville.
Lithosol	Uplands	Cherty limestone.	Steep stony land.

Gray-Brown Podzolic soils

As shown in table 10, most of the soils of the uplands belong to the Gray-Brown Podzolic great soil group.

MENFRO, WINFIELD, and WELDON soils have developed under a deciduous forest in which red and white oaks predominated. Differences among these soils are indicated in tables 7, 8, and 9.

LINDLEY soils have developed from glacial till under a mixed oak forest. Their surface soil is thin, and their subsoil is fine-textured and plastic. They normally occur below ridgetops that are occupied by Weldon or Marion soils.

UNION soils are light colored and forested; they have developed from thin loess overlying cherty limestone. They occur in the western part of the county, normally on lower slopes in association with the Lindley and Weldon soils. A weakly to moderately developed fragipan layer may not always be present in areas of Union soils in St. Charles County.

Gray-Brown Podzolic-Planosol intergrade

BOGOTA soil is classified as transitional between the Gray-Brown Podzolic and Planosol great soil groups. It is an imperfectly drained associate of the Winfield soils and occupies the more nearly level ridgetops. The A_2 and B_2 horizons are more strongly developed and contrasting than comparable horizons in the Winfield soils but less so than the same horizons in the Marion soil. The Bogota soil has a deeper deposit of loess, which may explain the difference in its development.

Prairie soils

The Prairie soils have developed under grassland vegetation, mainly on terraces in St. Charles County.

LESLIE soil has developed from a moderately deep deposit of loess on gently sloping upland that originally supported a mixed prairie-forest vegetation.

BLOCKTON, RILEY, and LOMAX soils have developed on terraces and have dark surface soils. The Blockton soil has formed on fairly heavy-textured sediments and resembles the Planosols. The Lomax soil has developed on sandy loam river deposits. The Riley is a sandy dark-colored soil subject to movement by wind and excessively drained. The Lomax soil has a deeper surface layer than the Riley and is not so sandy; it is open and well drained throughout the profile.

Planosols

Planosols have developed on the terraces and uplands from loess or alluvium. They have one or more compact layers of high clay content that interfere with drainage and permeability.

MARION soil is an imperfectly drained associate of the Weldon soils. It occurs on nearly level ridgetops in the western part of the county. It is characterized by prominent A_2 and B_2 horizons and is considered to be a well-developed Planosol. The Bogota soil, in contrast, is transitional between the Planosols and Gray-Brown Podzolic soils in development.

RACOON and BURRELL soils have developed from mixed alluvial deposits on terraces. They are imperfectly drained. The Racoon soil is strongly acid throughout. It has a silty surface soil, but its heavy compact subsoil causes slow permeability of air and water. The Burrell soil occurs in association with the Racoon soil. Its subsoil is plastic, but not so heavy or compact as that of the Racoon soil.

Mexico soil has developed under prairie vegetation from shallow loess. The fine-textured compact subsoil causes slow penetration of air and water.

Humic Gley soils

Humic Gley soils develop in swampy or marshy places. They have dark-colored, moderately deep, organic-mineral horizons underlain by gray or dark-gray clay that has been saturated with water for a long time in the presence of organic matter.

Dunning and Wabash soils are dark, heavy textured, and poorly drained. They have developed on alluvium under a vegetation consisting mainly of swampgrasses.

Low-Humic Gley soils

Low-Humic Gley soils are imperfectly to poorly drained. They have a very thin surface horizon moderately high in organic matter, below which occur mottled gray gleylike layers that differ little in texture.

Beaucoup soil is dark, fine-textured and poorly drained. It occurs on bottom lands along the Missouri River. The profile is fine-textured to depths of many feet.

Jacob soils have developed on fine-textured alluvium under a vegetation consisting mostly of swampgrasses. They have lighter colored and thinner surface layers than the Wabash soils. They are very poorly drained.

Alluvial soils

The Alluvial soils develop from recently deposited alluvium. The alluvium has not been in place long enough to have been much modified by climate, vegetation, or other soil-forming processes. In fact, the alluvium has been in place such a short time that climate, vegetation, and other soil-forming processes have changed it very little or not at all. The Alluvial soils of this county have been differentiated mainly on the basis of drainage, texture, or kind of parent material.

Cuivre and Westerville soils have a gray silt loam surface soil. The Cuivre has a clay subsoil, but the Westerville has a silty clay loam subsoil.

Onawa soil has a fine-textured and moderately dark surface soil, which is underlain by sand at depths of a few feet.

Huntington, Sarpy, and Sharon soils are well drained and medium textured. They differ in kind of parent material. The Sarpy soils have formed on calcareous sediments; the Sharon soil on sediments derived from loess and till; and the Huntington soil, mainly on sediments that have been washed from soils derived from limestone.

Ray soil has a light-brown, friable, silt loam surface layer, which overlies a dark-colored, heavy-textured material that represents a buried soil of the bottom lands.

Riverwash consists of recent alluvial deposits; the texture varies but is predominantly sandy.

Lithosols

Lithosols consist of freshly and imperfectly weathered hard rock and are largely confined to steeply sloping land.

STEEP STONY LAND has been mapped as a Lithosol in this county. It consists of shallow, light-colored, stony material derived from cherty limestone and sandstone. It supports a mixed oak and hickory forest.

ADDITIONAL FACTS ABOUT THE COUNTY

Settlement and Population

St. Charles County is the site of some of the oldest settlements in Missouri. The first settlement was made in the name of the Spanish government in 1769. Daniel Boone was one of the early settlers; he commanded a fort on Femme Osage Creek from 1797 until Spain ceded the territory to France in 1800. The area now within the boundaries of the county was part of the Louisiana Purchase, which came into the possession of the United States in 1803.

The county had a population of 4,058 in 1821, when Missouri was admitted as a State. A large German immigration occurred in 1823–24, and again in 1840. Other settlers came from Kentucky, Tennessee, Virginia, and North Carolina. Most of the present residents are descendants of the early German settlers.

In 1950, the county had a total population of 29,834, of which 52 percent was classified as rural. The city of St. Charles had a population of 14,314. Other towns and villages are Wentzville, population 1,227; O'Fallon, 789; St. Peters, 377; Augusta, 218; Portage des Sioux, 264; and Cottleville; Defiance; Matson, New Melle; and Weldor Springs.

The county is within the orbit of the St. Louis metropolitan area. Many of the residents commute to work in St. Louis. Railway and highway facilities are extensive. Supplementary gravel roads make all parts of the county easily accessible. The city of St. Charles has railroad car shops and a shoe factory. The small towns serve as local trading points. A large sandstone quarry is located at Klondike, near Augusta. Limestone for local needs is quarried in many places.

Agriculture

Major crops

The major crops in the county are wheat, corn, hay, and oats. The acreage in these crops is shown for stated census years as follows:

	1919	*1929*	*1939*	*1949*
Wheat, threshed or combined	93, 488	56, 048	66, 244	48, 196
Corn for all purposes	44, 662	39, 287	39, 447	47, 953
Hay, harvested [1]	17, 676	21, 044	19, 092	18, 257
Oats, threshed or combined	8, 734	3, 693	4, 618	5, 110

[1] Does not include annual legumes harvested for hay.

Wheat has always been the most important crop; it is grown both on the uplands and the river bottoms. Rye and barley are grown on a small acreage, mainly for fall and spring pasture.

Corn is second to wheat in acreage. It is grown on both the uplands and the bottom lands, but far more extensively on the bottom lands. Because of soil erosion, the acreage of corn grown on the more rolling uplands has decreased markedly in recent years.

Recently soybeans have become an important grain crop, especially on soils of the river bottoms. A total of 11,155 acres of soybeans was harvested for beans in 1949.

The acreage of forage legumes has long been large because it is the practice to grow red clover or Korean lespedeza in the wheat. The second cutting of red clover is frequently threshed for seed. Alfalfa is extensively grown on the bottom lands and on the better soils of the uplands. In 1949, a total of 5,920 acres of alfalfa was cut for hay. Korean lespedeza is widely used on all upland soils where small grains are grown. The recent increase in use of legumes results from the expansion of dairy farming and livestock growing.

Minor crops

Apples, peaches, pears, cherries, plums and prunes, and grapes are grown in small orchards or vineyards, mainly for home use. The 1950 census reports trees and vines of bearing age in the county as follows:

	Number
Apple trees	7,247
Peach trees	9,771
Pear trees	1,312
Cherry trees	1,333
Plum and prune trees	1,511
Grapevines	14,773

Conditions for growing of tree fruits and grapes are favorable, particularly on the deep Menfro soils of the uplands. The rolling topography provides good air drainage. St. Louis is a large nearby market.

Market vegetables are grown on a small scale on the river bottoms northeast of St. Charles. In 1949, a total of 195 acres was in vegetables harvested for sale. The large area between St. Charles and Orchard Farm is occupied by the Lomax soil and other deep, permeable, highly fertile soils that offer excellent possibilities for growing a wide variety of vegetables. The high value of this land and its nearness to the St. Louis market eventually may bring much of it into vegetable production.

The sandy Sarpy soils of the bottom lands are well suited to potatoes, but much of the acreage is subject to occasional overflow, which discourages the growing of potatoes or other vegetable crops.

Pasture

Pasture covered about 26 percent of all land in farms in 1949. The permanent pastures are located mainly on the less productive soils, steeper slopes, and more severely eroded areas of the uplands. The soils are relatively shallow. The rooting zone for plants may be very limited. Much of the rainfall is lost as runoff; shortages of soil moisture are common.

The pastures generally have an inferior grass cover. Thin stands of redtop and wild grasses are common. Korean lespedeza, which has become the dominant forage crop, occurs in practically all the pastures. Bluegrass will grow in permanent pastures, but it does not thrive and form a sod on the poorer soils. Bluegrass and clovers make a luxuriant growth on the better soils of the bottom lands, but only a very small acreage of these soils is in pasture.

Forage production can be increased greatly on most of the upland soils by applying topdressings of fertilizer, lime, and manure; protecting the land from erosion; and controlling grazing. Application of these practices on the steep slopes and dissected areas is difficult. For much of the poorer pasture land, improvement is best accomplished by plowing, adding lime and fertilizer, and then reseeding.

Livestock

Livestock is raised on practically all farms, but it is only on the specialized dairy farms that livestock products are the main source of income. Dairying is most extensively practiced in the area between St. Charles and Wentzville, but opportunities for expansion of the industry to other sections are favorable. St. Louis offers a large nearby market. Development of the dairy industry would make it easier to follow a program of soil management that would maintain productivity of the soils at a high level.

Forests and Wildlife

Forested land is one of the neglected resources in St. Charles County. The 1950 census reports indicate that woodland covers about 15 percent of the county, and that 60 percent of the farms in the county have some woodland. The greater portion of the woodland occurs in the southwestern part of the county, west and south of State Highway No. 40. The drainage area of Femme Osage Creek is largely forested. Most of the forested land is hilly and nonarable.

The character of the soils, the many steep slopes, and the severity of erosion all combine to make establishment and maintenance of woodlots desirable on many farms. Trees grow rapidly in these areas not suitable for crops or pasture. Even the steepest slopes that have a deep cover of loess are good for forest.

Small fur bearers, rabbit, squirrel, quail, pheasant, and migratory waterfowl are relatively abundant. Extensive areas of poorly drained bottom land are maintained as hunting preserves. The State Conservation Commission operates a wildlife refuge near Weldon Spring. Among the landowners, there is a general interest in protection of wildlife.

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SOILS OF ST. CHARLES COUNTY, MO., SUMMARY OF IMPORTANT CHARACTERISTICS

Map symbol	Soil	Position on landscape	Parent material	Surface soil			Subsoil				Overflow hazard	Wetness hazard	Erosion hazard	Workability	Natural drainage
				Color	Organic-matter content	Common range in thickness	Color	Texture	Consistence	Permeability					
						Inches									
BA	Beaucoup clay	River bottoms	Fine-textured alluvium	Gray to black	High	8–10	Gray	Clay	Very plastic when wet	Very slow	Severe	Severe	None	Poor	Poor to very poor.
BB	Blockton silt loam, 0 to 1 percent slopes.	Terraces	Silty material over fine-textured alluvium.	Dark grayish brown	Moderately high	12–14	Dark grayish brown	Clay	Friable when moist	Slow	None	Moderate	None	Good	Imperfect.
BC	Bogota silt loam, 0.5 to 2 percent slopes	Uplands	Deep loess	Brownish gray or yellowish brown.	Low	7–10	Gray and brown	Silty clay	Very friable when moist	Slow	None	Moderate	Slight	Good	Imperfect.
BD	Burrell silt loam, 1 to 3 percent slopes	Terraces	Mixed alluvium	Light brownish gray	Low	7–14	Mottled yellow, gray, and brown.	Silty clay	Very firm when moist	Slow	None	Moderate	Moderate	Fair	Imperfect.
CA	Cuivre silt loam	River bottoms	Silt over fine-textured alluvium.	Light brownish gray	Medium to low	8–12	Gray and brown	Clay or silty clay	Very plastic when wet	Very slow	Severe	Severe	None	Fair	Poor.
DA	Dunning silt loam	Creek bottoms	Silt over fine-textured alluvium.	Dark gray	Moderately high	10–14	Gray or olive gray	Silty clay	Plastic when wet	Slow	Moderate	Severe	None	Fair	Poor.
HA	Huntington silt loam	Creek bottoms	Silty alluvium	Brown	Moderately high	10–14	Reddish brown	Silt loam	Friable when moist	Rapid	Moderate	Slight	None	Good	Good.
HB	Huntington silt loam, colluvial variant, 1 to 5 percent slopes.	Alluvial fans	Silty alluvium	Brown	Moderately high	8–14	Brown or reddish brown	Silty clay loam	Friable when moist	Rapid	Moderate	Slight	None	Good	Variable.
JA	Jacob clay	River bottoms	Fine-textured alluvium	Gray	Low	6–8	Gray	Clay	Very plastic when wet	Very slow	Severe	Very severe	None	Very poor	Very poor.
JB	Jacob silty clay loam	River bottoms	Fine-textured alluvium	Gray	Low	7–9	Gray	Clay	Plastic when wet	Very slow	Severe	Severe	None	Poor	Very poor.
LA	Leslie silt loam, 2 to 5 percent slopes	Uplands	Loess	Dark gray or dark grayish brown.	Medium	8–14	Grayish brown mottled with yellowish brown.	Silty clay loam	Very firm when moist	Moderate	None	Slight	Moderate	Good	Imperfect.
LB	Lindley loam and clay loam, 2 to 6 percent slopes.	Uplands	Glacial till	Pale brown or brownish gray.	Low	4–8	Yellowish brown	Sandy clay	Plastic when wet	Slow	None	None	High	Fair	Good.
LC	Lindley loam and clay loam, 7 to 12 percent slopes.	Uplands	Glacial till	Pale brown or brownish gray.	Low	3–7	Yellowish brown	Sandy clay	Plastic when wet	Slow	None	None	Very high	Poor	Good.
LD	Lomax fine sandy loam	Terraces	Sandy alluvium	Dark brown	Moderately high	16–20	Grayish brown to brown	Sandy loam	Friable when moist	Rapid	Slight	None	None	Very good	Good.
MA	Marion silt loam, 1 to 3 percent slopes	Uplands	Shallow loess	Light gray	Low	7–9	Mottled yellowish gray, grayish brown, and yellowish brown.	Clay	Very plastic when wet	Very slow	None	Moderate	Moderate	Fair	Imperfect.
MB	Menfro silt loam and silty clay loam, 2 to 6 percent slopes.	Uplands (river hills)	Deep loess	Grayish brown to yellowish brown.	Low	9–17	Brown or yellowish brown	Silty clay loam	Friable when moist	Moderate	None	None	Moderate	Good	Good.
MC	Menfro silt loam and silty clay loam, 7 to 15 percent slopes.	Uplands (river hills)	Deep loess	Grayish brown to yellowish brown.	Low	4–12	Brown or yellowish brown	Silty clay loam	Friable when moist	Moderate	None	None	Severe	Fair	Good.
MD	Menfro silt loam and silty clay loam, 16 to 25 percent slopes.	Uplands (river hills)	Deep loess	Grayish brown to yellowish brown.	Low	2–12	Brown or yellowish brown	Silty clay loam	Friable when moist	Moderate	None	None	Very high	Fair	Good.
ME	Mexico silt loam, 2 to 4 percent slopes	Uplands	Shallow loess	Dark grayish brown	Medium	7–12	Grayish brown	Clay	Very plastic when wet	Very slow	None	Moderate	High	Good to fair	Imperfect.
OA	Onawa clay loam	River bottoms	Fine-textured material over sandy alluvium.	Dark brown	High	10–30	Yellowish brown or light brown.	Sandy loam	Very friable when moist	Rapid	Moderate	Moderate	None	Fair	Imperfect.
RA	Racoon silt loam, 0 to 1 percent slopes	Terraces	Mixed alluvium	Light gray	Low	8–12	Mottled gray or grayish brown.	Clay or silty clay	Plastic when wet	Very slow	None	Severe	None	Fair	Imperfect.
RB	Ray silt loam	River bottoms	Silty alluvium	Light brown	Medium	10–60	Dark gray	Silty clay loam	Friable when moist	Slow	Moderate	Moderate	None	Good	Moderately good.
RC	Riley loamy fine sand	Terraces	Sandy alluvium	Dark brown	Moderately high	6–12	Yellowish brown	Fine sand	Very friable to loose when moist.	Very rapid	Slight	None	Moderate (by wind).	Fair	Somewhat excessive.
RD	Riverwash	River bottoms	Mixed alluvium	Pale brown	Low	Variable	Variable	Variable	Variable	Variable	Very severe	Very severe	None	Variable	Variable.
SA	Sarpy loamy fine sand	River bottoms	Sandy alluvium	Yellowish brown	Low	8–20	Light brown	Silt loam to fine sand	Very friable to loose when moist.	Very rapid	Moderate	Slight	Slight (by wind).	Fair	Somewhat excessive.
SB	Sarpy very fine sandy loam	River bottoms	Sandy alluvium	Yellowish brown to grayish brown.	Low	12–30	Light brown	Loamy fine sand or fine sand.	Very friable to loose when moist.	Very rapid	Moderate	Slight	None	Good	Good.
SC	Sharon silt loam	Creek bottoms	Silty alluvium	Brown to grayish brown	Medium	14–20	Light brown	Silt loam	Friable when moist	Moderate	Moderate	Slight	None	Good	Good.
SD	Steep stony land, 15 to 35 percent slopes	Uplands	Cherty limestone	Dark brown	Low	3–7	Reddish brown	Stony silty clay	Firm when moist	Variable	None	None	Slight	Good	Somewhat excessive.
UB	Union silt loam, 4 to 11 percent slopes	Uplands	Shallow loess over limestone.	Light brown or grayish brown.	Low	4–8	Brown	Silty clay	Plastic when wet	Moderate	None	None	High	Fair	Good.
UA	Union cherty silt loam, 8 to 20 percent slopes.	Uplands	Shallow loess over cherty limestone.	Yellowish brown	Low	4–8	Brown	Stony silty clay	Plastic when wet	Moderate	None	None	High	Very poor	Good.
WA	Wabash clay	River bottoms	Fine-textured alluvium	Black	High	14–22	Dark gray	Clay	Very plastic when wet	Very slow	Slight	Severe	None	Poor	Very poor.
WB	Wabash clay loam	River bottoms	Fine-textured alluvium	Black	High	14–22	Dark gray	Clay	Very plastic when wet	Very slow	Slight	Moderate	None	Fair	Very poor.
WC	Wabash silt loam	River bottoms	Silty material over fine-textured alluvium.	Dark gray to black	High	12–18	Dark gray	Clay	Very plastic when wet	Very slow	Slight	Moderate	None	Good	Poor.
WD	Weldon silt loam, 2 to 6 percent slopes	Uplands	Shallow loess	Grayish brown	Low	6–12	Yellowish brown	Silty clay	Plastic when moist	Very slow	None	None	High	Fair	Moderately good.
WE	Weldon silt loam and silty clay loam, 7 to 11 percent slopes.	Uplands	Shallow loess	Grayish brown	Low	3–9	Yellowish brown	Silty clay	Plastic when moist	Very slow	None	None	Very high	Fair	Moderately good.
WF	Westerville silt loam	Creek bottoms	Silty alluvium	Grayish brown	Medium	8–12	Brownish gray	Silty clay loam	Friable when moist	Slow	Moderate	Moderate	None	Good	Imperfect.
WG	Winfield silt loam, 2 to 6 percent slopes	Uplands	Deep loess	Dark grayish brown	Low	6–14	Yellowish brown	Silty clay loam	Slightly plastic when moist.	Moderate	None	None	Moderate	Good	Moderately good.
WH	Winfield silt loam and silty clay loam, 7 to 12 percent slopes.	Uplands	Deep loess	Dark grayish brown	Low	3–10	Yellowish brown	Silty clay loam	Slightly plastic when moist.	Moderate	None	None	High	Good	Moderately good.

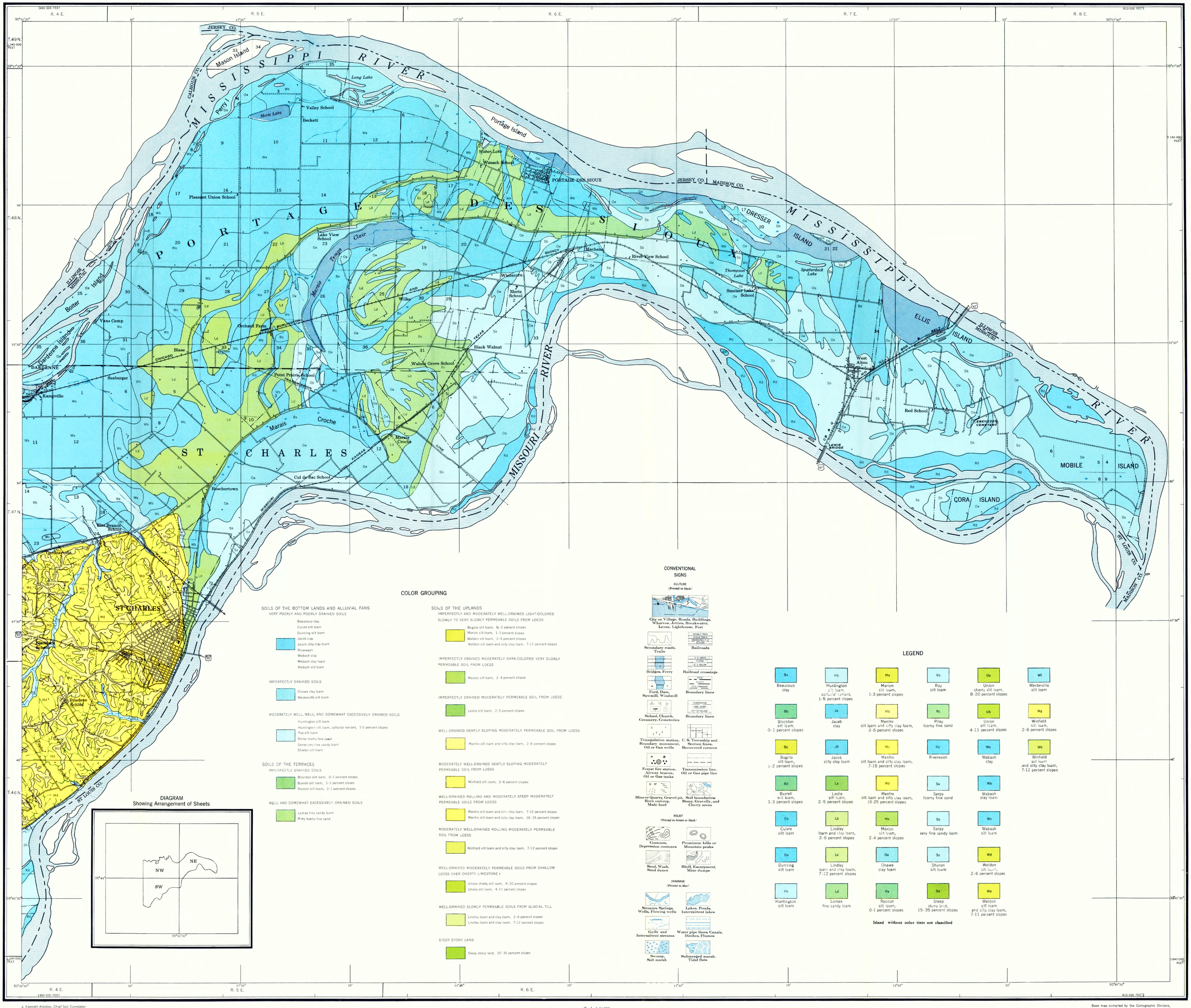
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MAP

ST. CHARLES COUNTY-MISSOURI

NORTHEASTERN SHEET

MISSOURI AGRICULTURAL EXPERIMENT STATION



COLOR GROUPING

SOILS OF THE BOTTOM LANDS AND ALLUVIAL FANS

VERY POORLY AND POORLY DRAINED SOILS

Beaucoup clay
Cuivre silt loam
Dunning silt loam
Jacob clay
Jacob silty clay loam
Riverwash
Wabash clay
Wabash clay loam
Wabash silt loam

IMPERFECTLY DRAINED SOILS

Onawa clay loam
Westerville silt loam

MODERATELY WELL, WELL, AND SOMEWHAT EXCESSIVELY DRAINED SOILS

Huntington silt loam
Huntington silt loam, colluvial variant, 1-5 percent slopes
Ray silt loam
Sarpy loamy fine sand
Sarpy very fine sandy loam
Sharon silt loam

SOILS OF THE TERRACES

IMPERFECTLY DRAINED SOILS

Blockton silt loam, 0-1 percent slopes
Burrell silt loam, 1-3 percent slopes
Racoon silt loam, 0-1 percent slopes

WELL AND SOMEWHAT EXCESSIVELY DRAINED SOILS

Lomax fine sandy loam
Riley loamy fine sand

SOILS OF THE UPLANDS

IMPERFECTLY AND MODERATELY WELL-DRAINED LIGHT-COLORED SLOWLY TO VERY SLOWLY PERMEABLE SOILS FROM LOESS

Bogota silt loam, ½-2 percent slopes
Marion silt loam, 1-3 percent slopes
Weldon silt loam, 2-6 percent slopes
Weldon silt loam and silty clay loam, 7-11 percent slopes

IMPERFECTLY DRAINED MODERATELY DARK-COLORED VERY SLOWLY PERMEABLE SOIL FROM LOESS

Mexico silt loam, 2-4 percent slopes

IMPERFECTLY DRAINED MODERATELY PERMEABLE SOIL FROM LOESS

Leslie silt loam, 2-5 percent slopes

WELL-DRAINED GENTLY SLOPING MODERATELY PERMEABLE SOIL FROM LOESS

Menfro silt loam and silty clay loam, 2-6 percent slopes

MODERATELY WELL-DRAINED GENTLY SLOPING MODERATELY PERMEABLE SOIL FROM LOESS

Winfield silt loam, 2-6 percent slopes

WELL-DRAINED ROLLING AND MODERATELY STEEP MODERATELY PERMEABLE SOILS FROM LOESS

Menfro silt loam and silty clay loam, 7-15 percent slopes
Menfro silt loam and silty clay loam, 16-25 percent slopes

MODERATELY WELL-DRAINED ROLLING MODERATELY PERMEABLE SOIL FROM LOESS

Winfield silt loam and silty clay loam, 7-12 percent slopes

WELL-DRAINED MODERATELY PERMEABLE SOILS FROM SHALLOW LOESS OVER CHERTY LIMESTONE

Union cherty silt loam, 8-20 percent slopes
Union silt loam, 4-11 percent slopes

WELL-DRAINED SLOWLY PERMEABLE SOILS FROM GLACIAL TILL

Lindley loam and clay loam, 2-6 percent slopes
Lindley loam and clay loam, 7-12 percent slopes

STEEP STONY LAND

Steep stony land, 15-35 percent slopes

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort
Secondary roads, Trails
Railroads
Bridges, Ferry
Railroad crossings
Ford, Dam, Sawmill, Windmill
Boundary lines
School, Church, Creamery, Cemeteries
Boundary lines
Triangulation station, Boundary monument, Oil or Gas wells
U. S. Township and Section lines, Recovered corners
Forest fire station, Airway beacon, Oil or Gas tanks
Transmission line, Oil or Gas pipe line
Mine or Quarry, Gravel pit, Rock outcrop, Made land
Soil boundaries; Stony, Gravelly, and Cherty areas

RELIEF
(Printed in brown or black)

Contours, Depression contours
Prominent hills or Mountain peaks
Sand, Wash, Sand dunes
Bluff, Escarpment, Mine dumps

DRAINAGE
(Printed in blue)

Streams, Springs, Wells, Flowing wells
Lakes, Ponds, Intermittent lakes
Gully and Intermittent streams
Water pipe lines, Canals, Ditches, Flumes
Swamp, Salt marsh
Submerged marsh, Tidal flats

LEGEND

Ba Beaucoup clay	Hb Huntington silt loam, colluvial variant, 1-5 percent slopes	Ma Marion silt loam, 1-3 percent slopes	Rb Ray silt loam	Ub Union cherty silt loam, 8-20 percent slopes	Wf Westerville silt loam
Bb Blockton silt loam, 0-1 percent slopes	Ja Jacob clay	Mb Menfro silt loam and silty clay loam, 2-6 percent slopes	Rc Riley loamy fine sand	Uc Union silt loam, 4-11 percent slopes	Wg Winfield silt loam, 2-6 percent slopes
Bc Bogota silt loam, ½-2 percent slopes	Jb Jacob silty clay loam	Mc Menfro silt loam and silty clay loam, 7-15 percent slopes	Rd Riverwash	Wa Wabash clay	Wh Winfield silt loam and silty clay loam, 7-12 percent slopes
Bd Burrell silt loam, 1-3 percent slopes	La Leslie silt loam, 2-5 percent slopes	Md Menfro silt loam and silty clay loam, 16-25 percent slopes	Sa Sarpy loamy fine sand	Wb Wabash clay loam	
Ca Cuivre silt loam	Lb Lindley loam and clay loam, 2-6 percent slopes	Me Mexico silt loam, 2-4 percent slopes	Sb Sarpy very fine sandy loam	Wc Wabash silt loam	
Da Dunning silt loam	Lc Lindley loam and clay loam, 7-12 percent slopes	Oa Onawa clay loam	Sc Sharon silt loam	Wd Weldon silt loam, 2-6 percent slopes	
Ha Huntington silt loam	Ld Lomax fine sandy loam	Ra Racoon silt loam, 0-1 percent slopes	Sd Steep stony land, 15-35 percent slopes	We Weldon silt loam and silty clay loam, 7-11 percent slopes	

Island without color tints not classified

J. Kenneth Ableiter, Chief Soil Correlator.
W. H. Allaway, Chief Analyst, Soil Uses and Productivity.
G. D. Smith, Principal Soil Correlator, Northern States.
Area inspected by A. M. O'Neal and G. D. Smith, Inspectors, and E. D. Fowler, Principal Soil Correlator.
Soils surveyed 1938-41 by W. D. Shrader, in Charge, N. S. Hall and M. E. Springer, Missouri Agricultural Experiment Station, and A. T. Sweet, U. S. Department of Agriculture.

Scale 1:48,000
1 0 1 2 Miles
5000 0 5000 10000 Feet

Base map compiled by the Cartographic Division, Soil Conservation Service, USDA, from 1941 aerial photography and USGS topographical quadrangles.
Soil Survey from 1937 aerial photography.
Polyconic projection, 1927 North American datum.
10 000 foot grid based on Missouri (East) rectangular coordinate system.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1955 O—342061

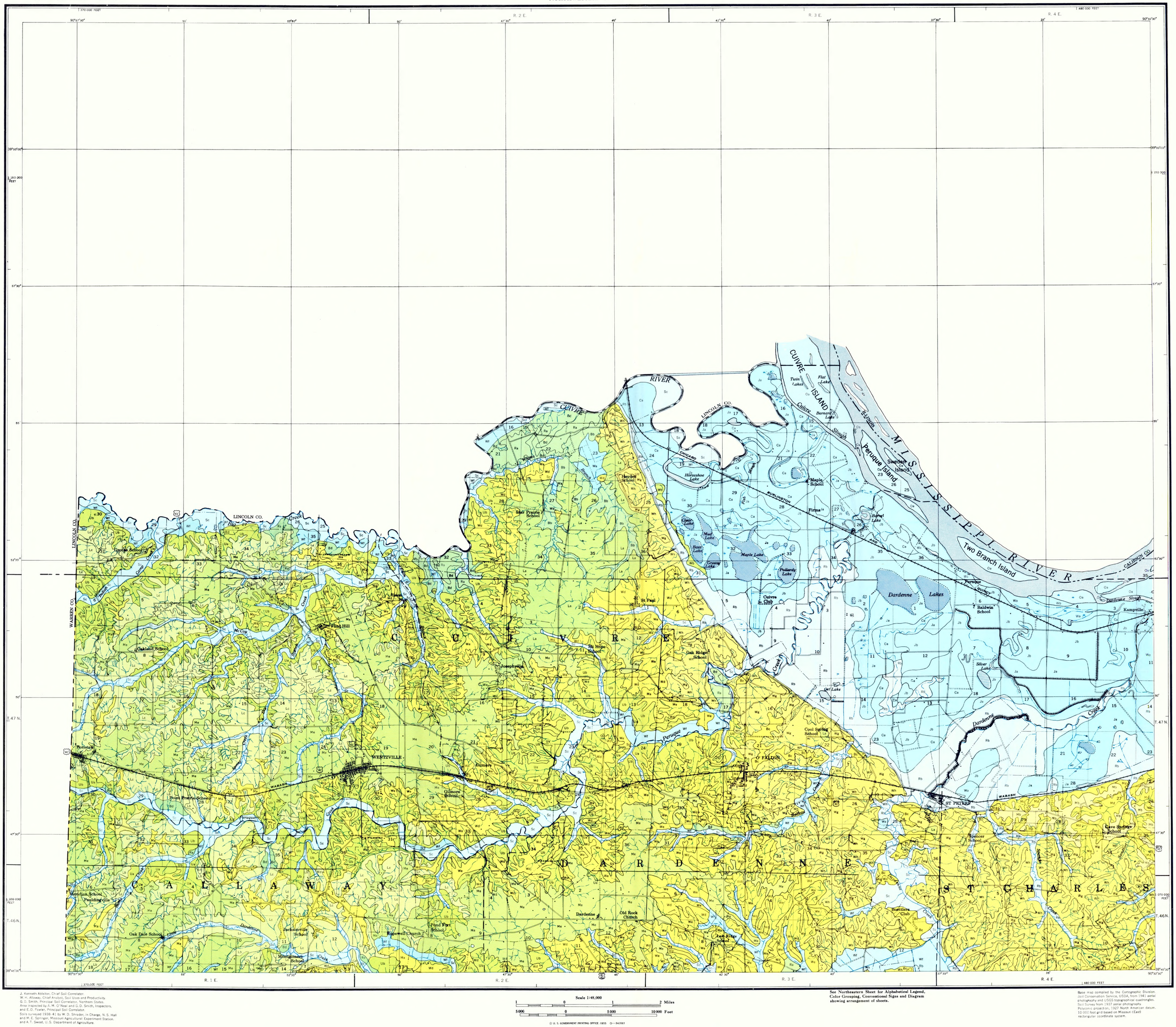
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MAP

ST. CHARLES COUNTY-MISSOURI

NORTHWESTERN SHEET

MISSOURI AGRICULTURAL EXPERIMENT STATION



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Scale 1:48,000

1 0 1 2 Miles

5 000 0 5 000 10 000 Feet

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See Northeastern Sheet for Alphabetical Legend, Color Grouping, Conventional Signs and Diagram showing arrangement of sheets.

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U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MAP

ST. CHARLES COUNTY-MISSOURI

SOUTHWESTERN SHEET

MISSOURI AGRICULTURAL EXPERIMENT STATION

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Scale 1:48000

1 0 1 2 Miles

5000 0 5000 10000 Feet

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